NEWSLETTER No. 16

REMOTE IMAGING GROUP

MARCH 1989

REMOTE IMAGING GROUP (R. I. G.)

NEWSLETTER No. 16 MARCH 1989

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Editorial and Secretaries page

Well here it is at last, at least 4 weeks late, I do apologise Gentlemen but problems with a new version of the word processor and professional commitments have been the cause.

For both new and old members this is the first issue of 1989 and already two new weather satellites have been launched and ASTRA, the TV satellite has become operational. The first new satellite was MET 2-18 for which we have Keplers in this issue but little else. For those of you who listen in the evening it has been reported to be producing 20 lpm infra red images. Any volunteers for a frame store modification ?! The second 'bird' was MOP 1 the first operational Meteosat. One member has reported images apparently received from the Meteosat 3 position with the logo 'MET 4'. Its not clear if this was a relay via MET 3 or a direct transmission. Anyway its due to come on stream on 1st June this year and I would welcome any submissions from members describing its new features. I do know that there will be a new schedule which will include an increased number of relayed transmissions from the American GOES series.

As I'm constantly being asked for sources of information for new members I would recommend the following: An Introduction to Weather Satellites and their Reception by Mike Mansfield, available from RIG at £2.00 + 50p p&p, Weather Satellite reception by Chris Hornby, £5.50, see their ad in this issue and finally for those who need an explanation of Keplerian elements and how they describe orbital parameters, the AMSAT-UK publication: Satellite Tracking Software for the Radio Amateur by John Branegan. see RIG helplines for the AMSAT-UK address.

Our rally schedule this year is now only four events following the cancellation of the NEC event. They are:

RSGB VHF Convention, Sandown Park Racecourse, Esher	16 April
BATC Convention, Crest Hotel, Nr. Junc. 2 of M6, Coventry	30 April
Elvaston Castle, near Derby	11 June
Woburn Abbey, Bedfordshire	6 August

Don't forget our annual general meeting will be held as usual at the VHF Convention, lecture program 'C' at 15:15 hours. All members are encouraged to attend to hear the reports of the outgoing committee and to elect a new one. Any members wishing to raise specific issues at the agm are asked to advise the secretary in writing so they may be properly scheduled.

Finally, as ever, please keep on sending in you contributions for the newsletter, without them the RIG will cease to function; and indeed many thanks to the contributors for this issue.

Phil, G8XTW

CHAIRMAN'S WAFFLE

We all tried very hard to get RIG15 out to you in time for the Christmas period. Phil produced the master copies for the whole Newsletter in record time. Our printers managed to print the largest yet Newsletter in record time and just before Christmas at that. The first 600 arrived on the Monday 19th. at lunch time, but were at our local Post Office before 3p.m. the same day. The remainder arrived at lunch time on Wednesday 21st., which is our local half day closing, so it wasn't any good rushing around immediately, but they were at the Post Office on Thursday morning the 22nd. Some of you should have received them before Christmas but if not very shortly afterwards, remember it takes until the following Wednesday for the Post Office to get back to work.

While on the subject of Post, it does sometimes occur that Newsletters get lost in the Post. If you think that a new Newsletter is due and you haven't received yours yet, have a word with any fellow members if you know any, or give me a ring to see if a new one has been posted. If it already has been posted some time I will send you another one, but remember we don't always get them out by the date that we should.

For some considerable time we have been trying to reproduce better quality pictures in the centre of the Newsletters. We have failed to achieve the quality we want. The originals are very good and there is nothing that can be done at the source to improve the original article. All our problems are to do with the printing processes. We have found an answer to this but it is expensive. The results would be spectacular, but because of the extra expense we are still looking for economical ways around this problem. If one is not found then we will try just one issue, probably the September 1989 Newsletter, using this alternative source. If this is successful it will mean another price increase the following year so that we could use this source every time. If there are any printers among our Members who could assist us, either with information or products, please contact the me as we can use some help. All the present attempts have only produced mediocre results and we know that this area really does need to be improved.

I mentioned in an earlier Newsletter that I had a Tektronix 4631 Hard Copy Unit, and that I was trying to get a circuit diagram for it, without success. I have now obtained details of the later 4634 unit which is similar but unfortunately quite a fair bit different. It has whetted my appetite to do work on the 4631 machine, as it contains all the workings of a dry photographic system. It contains a fibre optic faceplate CRT which exposes the paper as it passes

over it, a guillotine and a heated section which develops the latent image. It would seem to have a great potential. The main snag is that the system works at 350 lines per second, which you will appreciate is a bit slow for 15KHZ fast scan line rates and too fast for normal weather satellites speeds. It is normally much easier to slow things down than the opposite so if I could obtain a circuit diagram for the 4631, work could proceed towards a 2 or 4 lines per second system. I am told that these machines are sometimes available on the surplus market at very reasonable prices, so keep your eyes open, but the paper to feed them with is not cheap, but nor is ordinary photographic paper. Help with the circuit diagram would be very much appreciated.

I've had a DBS system going for several months. It uses the standard units with one exception, the dish is a 12 foot monster. No problem you might think just large signals, don't you believe it.

If you have had any experience with a DBS dish you will know that the dish positioning is quite critical. Moving this monster from one satellite to another is not a job you do in 30 seconds, especially if you don't know exactly where the next satellite is. Keeping it there is also just as big a problem. I have already moved it to ASTRA's position and hope that that's the last move I have to do for some time. I hope the programs are worth the trouble but do have I the time to watch them? I suppose the rest of the family can.

Henry has been getting in trouble with Officialdom yet again! When I was given planning permission for my new house it was conditional on the old one being removed rather quickly after I had moved into the new one. We all know that time flies by and Henry was well and truly beyond the time it was supposed to have disappeared. I then had a visit from the duly appointed person. Needless to say Henry has got a move on since, but two homes into one just physically don't go, well not without a struggle. Most of the contents already had been removed into the back two rooms of the old house enabling me to demolish the front part of the establishment. The trouble is that these back rooms are packed with stuff and I don't have any good storage available to put it in and I cannot afford to build any new storage. I don't know how to get out of this catch 22 situation but if Officialdom does give me some leeway then I'm certain all will be well. I have shown willing on my part in that I have already nearly completed demolishing the front part so they know that the intention is there, it's just a bit more difficult to do things than it is to say them.

I am told by Des Watson that the 1988 Membership peaked at just under 1100 which in my mind is no mean feat. Mind you we do try to give value for money and provide you with the best that's available.

We try to include everything that a good weatherwatcher needs. We try to provide you with copies of the best pictures that are available from the best systems, even if we don't do them justice. We try to circulate you with all the latest circuits, modifications, hints and tips that come our way. We perhaps are not making the news but we do try and be as up to date with it as we possibly can. Altogether I am pleased by what we have achieved. However we must not be complacent, but continually try to improve even further. If there is anything that you feel we ought to be doing that we aren't, then tell us. I think we have the largest membership World-wide of any Weather Satellite Group, and we want to keep there and give you the best service possible. We do however need your help in keeping in this position. We need articles on anything connected with our group. Have a word with the Hon. Sec. just in case it's already being done, and don't sit on good ideas either, they may be just what I or someone else has been looking for.

Has anyone noticed that Meteosat 3 has been decontaminating it's sensors more frequently just recently? Perhaps it's just because it is new and the area hasn't completely lost all those atoms that are supposed to disappear into the vacuum of space. I gather that the I.R. sensor has to be cooled by a peltier heat pump device to give us images. This has to be thawed out every so often to get rid of the rime frost. Must have been a cold winter, or is that where all the Ozone is going? Have you noticed that certain CO2 and CO3 images are of lower definition than others? the horizontal definition is the same as usual but each line is repeated once, as in line doubling to give the appearance of the usual image. This only requires half the data processing. If you are watching on X1 you will not notice it, as you are only looking at every other line anyway. You can only see it if you are in the highest zoom mode. The country outlines are put in at the highest data rates, it's only the visual image that's reduced.

I was looking at was the input circuit of my Liverpudlian Down-converter and thought that it could be upgraded quite easily to a GASFET instead of the present NE64535. Only the RF input circuit and the DC conditions would need to be altered. The collector circuit could remain as the drain circuit but the voltage would need to be reduced to the individual device's own requirement. The input circuit would need to be abandoned but as the present NE64535 is mounted through the board lifting the input gate upwards would be easy. At present the emitter is directly connected to ground (0v) on the main board. So the source would need to be lifted up from ground and very well decoupled. As usual another project for when there's nothing else to do.

In a New Scientist article dated the 3rd of December 1988, mention was made of the numerous Satellites that have transmitters aboard and to the quality, or lack of it, of them. These are giving Radio astronomers a lot of problems, especially at their quiet frequencies of which 1666 MHz is one. That is the absorption frequency of the Hydroxyl Radicle OH. Oh says Henry, and makes further inquiries.

This effect is usually very narrow so it wouldn't go up to 1694.5 MHZ I'm told, but it is UV sensitive, meaning that it would vary with the incident sunlight. Unfortunately that takes place at high altitude 60 Km. So it would still occur in foggy weather which it doesn't. Observations of this effect described in the last Newsletter have continued, but I still don't have an explanation for it.

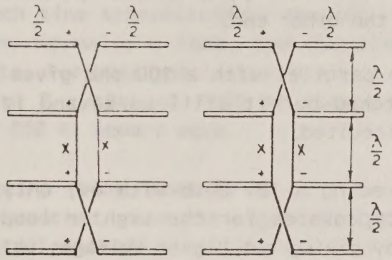
The effect seems to start just as first light appears. A general decline in signal at the approximate rate of 0.24 db per hour. This continues until mid afternoon when the reverse then occurs but at a slower rate of say 0.15 db per hour. The signal peaks just before dawn and the cycle repeats itself. On a foggy, overcast or rainy day the effect all but disappears, depending on the intensity of the weather. If it is a lovely sunny day as we are getting this winter the effect is much more intense, resulting in larger increases in attenuation, peaking say 4 db overall. All this would point to an UV effect but the rainy, foggy, overcast effect would indicate a low altitude cause. I suppose that it could be UV at low altitude. Time will tell as they say.

On page 34 of RIG15 there was a description of the antennae of Meteosat 3. This together with a very poor photocopy of a diagram of an earlier Meteosat, prompted me to do a few calculations and make a few assumptions. What follows is purely Henry's conjecture and I have no proof of any of it.

According to the packet article mentioned above, "The electronically despun antennae (EDA) consists of 32 columns of 4 dipole elements. This is similar to the diagram 9.21 in an early RSGB VHF/UHF Manual. These columns of dipoles are energised successively" etc. "4 columns of dipoles are energised simultaneously at any one time". 4 Columns at a time out of 32 makes 8 actual antennae sections. Going back to the early days of 432MHZ a popular antennae was the 16 element or the larger 64 element array. The larger being 32 dipoles and 32 reflectors. The 32 dipoles were end fed in 4 banks of 8. Each bank was fed by 300 ohm balanced open wire feeder. But these could also be regarded as 2 columns of 4 dipoles, see fig.1, especially if the method of feeding them was omitted!

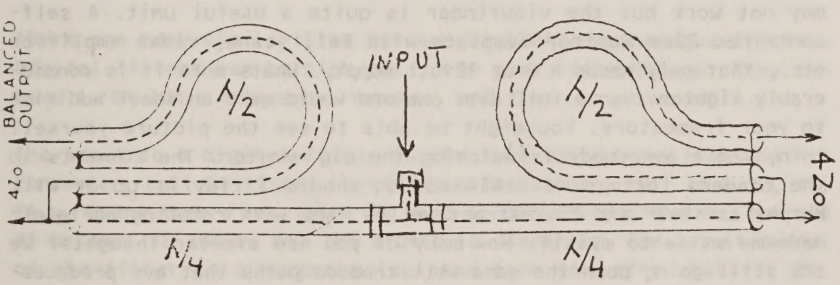
This started my grey stuff working. 2 Columns of 4 dipoles can be fed by 300 ohm balanced open wire feeder as per the old system.

If 2 of these sections are fed simultaneously it would then make 1/8 of the total antennae. The open wire feeder system for end feeding dipoles is quiet simple especially if you think of them as 4 centre fed full wave elements. If these 4 Elements are fed from the centre section then the adjacent Elements are fed in phase. But the remaining 2 Elements require a 180 degree twist in the feeder to feed them in the correct phase.



As said before these 8 dipoles require a feed impedance of about 300 ohms balanced. In these present times it is relatively easy to arrange a 4:1 balun to transform this to 75 ohms coaxial cable. Now we need to feed 2 of these at once. A quarter wave section of 87 ohm cable would transform this up to 100 ohms of which there would be two, then into a T piece and out comes a 50 ohm coax feed point.

NOT TO Scale.



As the satellite is spinning round then the 1/8 that is nearest the Earth is switched on to give the maximum received signal, when all is well. As we all know, things aloft are not as they should be, and I strongly suspect that, as something was being deployed or discarded, a retaining panel, clip, nose cone or some other extraneous metal was in collision with certain parts of the columns of dipoles, which were spinning at 100 R.P.M. and shorted out 3 open wire feeders.

Fortunately these were not adjacent ones otherwise we would have been in deeper trouble. Lets look at what would happen to 1/8 of the EDA if things went amiss. Each section is probably fed by one coax to a T piece and thence to 2 X 1/4 wave matching sections, thence to a 4 : 1 balun. If one of the 300 ohm open wire feeders was accidentally shorted out by being bashed or bent by something, remember the end elements are fed by 300 ohm open wire feeder with a 180 degree twist, which could be classed as vulnerable, what would happen? Not a lot, the short circuit on one end of the 1/4 wave section produces an open circuit at the other end.

An open circuit in parallel with a 100 ohm gives 100 ohms. The 50 ohm coax is mismatched but it still works and it is a lot better than being short circuited.

It's just like feeding a 12v bulb with 6v, only the transmitter output probably compensates for the lighter loading given by the higher impedance, by giving out higher voltages while these sections are connected, hence only the 3db drop in received signal. All the way through this item I have not referred to the reflectors, in this case I'm sure that the main spacecraft body is utilised for this and gives us all an extra 3db of signal. Well that's Henry's thoughts on the problem. Lets all hope it doesn't happen again. The next Meteosat may budget for a reduction in transmitter power output of 3 - 6 db, because of the availability of very low noise GASFET's. That will put a lot of systems on the borderline as far as signal strength is concerned.

Keep your eyes open for scrap home video cameras. The camera part may not work but the viewfinder is quite a useful unit. A self-contained 25mm monitor complete with EHT, scans, video amplifier etc., that only needs a 9 or 12volt supply. Whats more it is considerably lighter than a full size one and would make an ideal addition to your framestore. You might be able to see the picture yourself then, while everybody is watching the big monitor. The comments in the readers letters of RIG14 about "should I tidy it up or will Murphy strike?" and "...attract yellow vans with rotating aerials!" made me smile to myself. How many of you had similar thoughts? We are still going down the same well trodden paths that our predecessors passed down, but hopefully, better equipped and a little wiser. That's more than Henry's normal quota for this Newsletter. Sometimes inspiration comes easily and other times it really takes a lot of work. Lets hope that it isn't all waffle and some of you find a few gems in amongst it all. Until the next time take care and I'm sure we all look forward to meeting you at the forthcoming rallies etc. in 1989.

Yours
Henry

DIGITAL LINE SYNCHRONISATION for NOAA PICTURES

by Dick Boardman

When receiving satellite pictures, it is necessary to align the edge of the picture with the edge of the screen. This can, of course, be done manually but an automatic method is much more satisfying.

The start of each line transmitted by the satellite is marked with a 'sync' pattern, normally a tone, and the precise format varies with the satellite. For NOAA satellites there is two patterns. Channel A starts with 7 cycles of 1040 Hz square wave and channel B with 7 cycles of 832 Hz square wave.

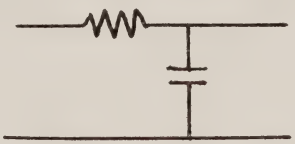
One way of detecting these tones is to tune an analogue circuit to one of these frequencies, pass the signal through it and start the line when the output exceeds a certain value. Several circuits have been published in this magazine which do this.

Another way, if the picture is being received on a computer, is to use a tuned digital filter.

As any hi-fi enthusiast with a CD player knows, the filtering of audio signals that is done with analogue filters can also be done with digital filters. Analogue filters are limited by the quality and accuracy of the components. Digital filters are limited by the sampling frequency and the speed at which the computer concerned can do arithmetic.

There are many similarities between digital and analogue filters. Digital filters can be high pass, low pass or band pass. They can have a 'Q' and a frequency response, and they can go unstable.

The input to a digital filter is the last value read from the A-D converter, call it Y1 and the previous few values, call them Y2, Y3, Y4... Every time a new value is read it becomes the new Y1. The old Y1 becomes Y2 and so on. The oldest is discarded. The latest output of the filter is a number calculated from the Y's. Call it Z1. Previous outputs will be Z2. Z3.... and again, as each new value is calculated, it becomes Z1 and the others move down. A very simple filter would be Z1 = (Y1+Z2)/2. This has an effect very similar to the analogue filter



The time constant depends on the sampling frequency. At the very start there is no value for Z2 and zero is used. This corresponds to an analogue circuit where the capacitors have no charge when the circuit is first switched on. Digital filters only work for frequencies less than half the sampling frequency which is why they can't be used at present for higher frequencies (current computers can't do arithmetic that fast).

The computers needed to make compact discs have to be much faster than current home computers. However there is a very simple tuned filter which will run on a home computer fast enough to detect 832 Hz.

Set the sampling frequency to four times the required resonant frequency (4*832 = 3328 Hz in this case) and calculate:

Z1=Y1-Y3+Y5-Y7+Y9-Y11+Y13-Y15

Z2=Y2-Y4+Y6-Y8+Y10-Y12+Y14-Y16

Only one of these two calculations need be done each sampling period.

If the input, before sampling, is constant DC level, all the Y's will be the same and both Z's will be zero. If the input is noise, the values will tend to average out and the Z's will be noise with an average of zero and an amplitude much less than the input noise. If the input is a low frequency sine wave the values will tend to cancel and the Z's will be samples from a sine wave of the same frequency but smaller amplitude. If the input is the sum of these signals then the output will be the sum of the outputs.

However if the input is a sine wave (or square wave) of the resonant frequency the numbers do not cancel and the Z's are samples of a sine wave of the same frequency but 8 times the amplitude. Furthermore, Z1 will be 90 degrees out of phase with Z2 the same as sine and cosine (cosine leads sine by 90 degrees) Since (sine squared)+(cosine squared)=1 it follows that (Z1 squared)+(Z2 squared) will be a constant whatever the relative phases of the input signal and the sampling signal.

For example, suppose the input signal is a long period of zeros followed by a unit square wave with frequency of 1/4 of the sampling frequency. Successive values of Y will be 0,0,0,0,0,0,0,1,1,0.0,1,1,0,0.....

```
Y    1  1  0  0  1  1  0  0  1  1  0  0  1  1  0  0  1  1
Z1   1    -1    2    -2    3    -3    4    -4    4
Z2      1    -1    2    -2    3    -3    4    -4    4
```

In a practical case these numbers will be multiplied by nearly the range of the A-D converter but noise will reduce the maximum values. In a practical case these numbers will be multiplied by nearly the range of the A-D converter but noise will reduce the maximum values. In practice it is not necessary to square the Z's. Adding the absolute values is sufficiently accurate. Apply these formulae to successive values of the input with out drawing any pixels and when the output exceeds a threshold of about 6 times the A-D range begin a line. Reset the sampling rate and start plotting the picture from the edge of the screen. A high threshold may cause it to skip a few lines as the satellite comes over horizon because of the noise on the signal. Since the line time is known it is only necessary to find the sync pattern once per picture.The gain of the filter may be increased by adding extra terms if necessary.

digital Filter design is a very complex subject and I have only mentioned one very simple special case. I hope I have included enough to allow programmers to use the result and to encourage those interested to consult text books on digital signal processing

Dick

AMIGA CORNER.....James Brown

Well last month's item certainly seemed to appeal to AMIGA owners..over 20 of you sent discs for copies of the demos! It seems as if this computer is at last finding favour with RIG readers. Many asked if the ICS interface mentioned in the December issue was as good as a RIG frame-store. Last time I couldn't have given you an answer, but thanks to my local friendly dealer Mike Channon of A.C.S., for a couple of months I have had on loan an actual ICS package, and the rest of this month's corner will be taken up by a review of what is a very exciting development. Incidentally, I don't intend to write this column every issue, but only if there is enough happening, or YOU send in suggestions! So if you have any comments/news here's the address to send them to:

21 Windsor Road,
PORTHCAWL,
Mid-Glam
CF36 3LR

Tel:(065671) 2632

ICS AMIGA fax interface & s/ware, version 2.1
Supplied by A.C.S. Systems, 19 Cilhaul Tce.,MOUNTAIN ASH, Mid-Glamorgan CF45 3ND Tel (0443) 476040

First the bad news...the unit currently retails at about £100.00, and it's due to rise by another £10 or so in the near future. You also need to own or purchase an Amiga computer.

What do you get then for such an outlay? At present you get a small unboxed pcb about 4"x 2" which fits into the parallel port on AMIGA 500/2000's, together with two disks and a manual. The first disk is the main program disk, and the other contains utilities for converting fax files to IFF types. (The software was apparently written by a 18 year old German wizz-kid).

The program disk is heavily protected, which means it can't be installed via Workbench to run with other progs, which is a pity, but it must be a contender for the fastest bootable disk around. About 15 secs. from insertion the programme is fully functional! The screen is then split into a scrollable window for viewing the fax transmissions, and a narrow but very extensive control panel along the bottom of the screen.

The manual is comprehensive, but lacks a step-by-step quick set-up section, which means you have to wade through almost the entire manual even to get started. Another off-putting feature is that the

pin-out diagram for the unit bears no resemblence to PCB supplied, hence I'd found some RIG members who'd already purchased the module finding real difficulty making sense of how to input a satellite signal.

Part of the problem is that the module is really orientated towards the short-wave fsk fax user, though it can receive direct satellite transmisions. I did check the unit out on a friend's s.w. receiver and receieved excellent fax pictures straight away, But for direct satellite reception you'll find you need to further demodulate your 2.4 kHz signal to a varying DC level in order to provide an acceptable input to the ICS module. If you've already got a frame-store then you can take a tap off the point before the A/D converter chip. Having overcome those intial problems the pictures that I then received I can only describe as stunning.

Using the highest Amiga resolution and with 16 grey, a picture of 1500 lines depth is possile! Enough to store an entire pass of most satellites. Imagine then being able to scroll at varying speeds up and down both during and after reception, and you've got a mouth watering piece of software!
The multitude of controls (via the mouse and key board) provide a very flexible user response. Variations of input black and white thresholds, 9 picture formats, 5 reception speeds, inversions in both directions of pictures, sideways scrolling, negative images, contrast and brightness correction, are just a few of the controls, whilst a special formatter crams over 1 meg of picture data when you want to save to disk. Up to 4 drives are supported, and I have even persuaded it to recognise a pair of 5.25 inch drives, so that I can save pictures to the real cheap floppies! There are loads of printer formats to cater for every conceivable printer, with enhancements for printing those specially long weather maps.

Amazingly the picture edge seems to sync up internally, rather than relying on the satellite sub-carrier or external pulses, so that it maintains positional accuracy even in the presence of interference. However this does mean that it is almost impossible to maintain the sync with the tape-recorded signal.
My verdict must be that this a superb piece of professionally compiled software, showing to the best some of the capabilities of the AMIGA. However, the software has a few niggling limitations which if the importers listen to the feedback from users will hopefully be taken up in future enhancements.

The picture feed in direction is fixed at North - South, which means for many satellites including METEOSAT initially the picture inverted in both directions. Its matter of seconds after reception to reverse that , but its annoying none the less.

The fastest line rate is 240, which for frame store owners means quite a magnified image. However at 640 pixels across, the ICS software will display an entire NOAA visual image, effectively about half the highest resolution of the frame store.

Without checking for an external sync signal its almost impossible to adequately receive tape recorded images, due to the fluctuations in recorder speed. There are spare input pins on the parallel port which could be utilised to accomplish this.

The file conversion is a pain ! It works, but it requires several changes of disk per picture, and doesn't recognise any other drives.

I suppose the ultimately the acid test is, would I sell my frame store ? The answer would be no..but..I also wouldn't like to be without the ICS module. If you can accept the reduction from 64 to 16 intensity levels then you might even prefer the ICS module, but there are limitations, and an assessment of your requirements before parting with what amounts to a quarter of the price of your computer would be wise.

If what you want is high definition, the ability to save to disk and play around with colours in one of the many AMIGA graphics packages then this is the all singing all dancing package for you.
If your chief concern is large numbers of luminance levels, and unattended operation, then the frame store wins.
But just in case your wondering ...yes I have bought it!

METEOSAT DIGITAL DISSEMINATION SERVICE

Interest in Meteosat Primary Digital transmissions (Primary Data Users) and NOAA High Resolution Picture Transmissions has been increasing.

It is for those who would like general overview of the spacecraft's dissemination in digital modes this brief was intended.

For the full technical specifications and requirements for a primary data user system (P.D.U.) the following manuals should be obtained from the European Space Agency (E.S.A.)

1.Primary Data User Station by Dundee University

2.Meteosat Ground Segment Hand Book

Both these publications are available through Meteosat, European Space Operations Centre, Robert Bosch Strasse No 5, 6100 Darmstadt, F.R Germany.

The Dundee University Primary Data User hand book will be of certain interest to the practically minded considering construction of a Primary Data User System.

The hand book covers all areas of construction, including photographs and measurements. Also the practical considerations are given and problem areas are covered.

At the time of writing this article, no information had been published for the software processing and collection of data after demodulation, other in No 1 above.

I have had the use over the past fourteen months of a primary data user station and image processing software. Using the system along side my own secondary (YU3UMV Framestore etc) the system certainly has shown the ease and quality of using a digitally formatted data as opposed to analogue. As all the data has been processed and calibrated before re-transmission to the satellite by Darmstadt, it is possible on reception of the data to make very precise measurements, i.e. the temperature of land, cloud and sea, can be made to the nearest degree in temperature. On a double resolution dissemination the image resolution is better than 2.5 kilometres for the visible sensor at the satellite sub-point.

On the present primary schedule a whole earth dissemination including the visible infrared and water vapour channels is disseminated at 18 minutes past each hour during daylight periods,

i.e. 0600 1800 G.M.T. This enables you to select which of the channels and what particular area of earth you wish to store and analyse data from each hour.

Meteosat's telemetry includes (in its basic form):

1. Imaging Data

2. Relayed imaging data

3. Data collection platform messages.

4. Housekeeping telemetry.

5. Ranging information.

For most of us we are interested in the imaging data. We can, therefore, concentrate on the three main types of transmissions.

A. Raw data

B. Primary user data.

C. Secondary user data.

Raw data.

Frequency 1686.833 MHz Format (P.S.K.) Phase Shift Keying. 166.667 Kbps This is the raw data collected from the groups of radiometric measurements sensors on board as follows:

Visible 1 sensor.

Visible 2 sensor.

Infrared 3 sensor.

Water vapour 4 sensor.

In its basic form the sensors are located inside the spacecraft and a lens on the side of the spacecraft focuses the image onto the sensor via a scan mirror. This mirror is incremented up to one line of scan for each revolution of the satellite. As the satellite spins each sensor detects emissions in its own specific frequency range and this data is then transmitted in its raw unprocessed form to Darmstadt, West Germany.

A complete image dissemination consists of 2,500 scan lines.The spacecraft revolves at the rate of one revolution per 600 milli seconds, thus 2,500 x 600 milli seconds equals 1,500,000.
1,500,000 divided by 1.000 equals 1,500.
1,500 divided by 60 seconds equals 25 minutes for each transmission.

On each revolution of the satellite the data including imaging data, sync. and datation takes 482 milli seconds total time. The remaining 118 milli seconds is filled using filler bit streams. The raw data is collected by Darmstadt, reformed, calibrated and processed. It is then re-transmitted back to the satellite in both digital (primary) and analogue (secondary) form.

Primary

Modulation P.S.K. 166.667 Kbps. Frequency (up) 2101.5-2105 Frequency (down) 1691- 1694.5.

Format A.

This is a whole disc image of the earth as seen by Meteosat. The A-formatted image can have 5 different spectral band combinations.

AI Infrared

AIV Infrared plus visible one.

AIVW Infrared plus visible one plus water vapour.

AIW Infrared plus water vapour.

AV visible one plus visible two. (double resolution).

Each transmission consists of

(a) Heading, (data ,time, sensors in use, types of format and image number).

(b) Image Data (sensor, channel, data)

(c) Conclusions (repeat of heading and updated information).

The schedule of dissemination from Meteosat P3 at the moment consists of an A format twice an hour. During daylight hours (0600-1700) AIV is transmitted at 18 minutes past each hour. AI is transmitted at 15 minutes past each hour.

After 1700 AIW and A1 replaces the AIV slot. At 11 46 each day a double resolution image is disseminated of the whole earth.

B Format

The B format covers the whole of Europe, from North Africa to Norway. Four different spectral bands combinations are used:

BI Infrared.

BIW Infrared plus water vapour.

BIV Infrared plus visible one.

BIVW Infrared plus visible one plus water vapour.

This dissemination structure consists of:

(a) Heading.

(b) Image data.

(c) Display texts (annotation)

(d) Conclusion.

The schedule of dissemination from Meteosat P3 at the moment consists of the B-formats transmitted twice an hour. BIVW is transmitted at 10 minutes past the hour. BIV is transmitted at 42 minutes past each hour. After 1900 BIW replaces BIV at 10 minutes past the hour.

D.C.P.

This is the data collection service operated for collection and dissemination of data from earth platforms. These can consists of seaborn floating platforms, land based collection platforms and meteorological stations. The information is transmitted to the spacecraft and re-transmitted to Darmstadt where it is reformatted stored and buffered before transmitting at later dates to the appropriate user. (This is the high speed digital data heard inbetween secondary disseminations).

Secondary Wefax Analogue Disseminations

Modulation AM/FM

Sub-carrier 2400 Hz Modulation index 80%. Frequency (up) 2101.5 -2102.0. (down) 1691. - 1694.5

Dissemination of the secondary transmissions include images derived from primary digital Meteosat and G.O.E.S. images. Cloud top height charts, Wefax charts, administrative documents. The disseminations can contain grids for map reference, coast lines, annotations.

C-format

This is the visual primary image sectorised into 24 sub-formats, i.e. C1-C24 (not all are used).

D -format

This is the infrared primary image sectoriserd into 9 sub-formats (i.e. D1-D9). E format is the primary water vapour image sectorised into 9 sub -formats.

Ranging Formats

VHF ranging for the satellite takes place on 149.34 MHz. S-band ranging. Ranging also takes place on s-band where the range rate is determined from the 2-way Doppler shift of the transmitted up carrier and the received down link frequency. Phase modulation with sub-carrier 836 KHz. Measurement then takes place on the Doppler shift and the frequency offset.

Practical Considerations (link calculations)

Before beginning construction of the primary data user station it will be necessary to estimate the overall performance required by the user. This can be done by estimating the gain of the antenna,i.e. dish and low noise amplifier and considering the receiver front end and the connection made to the low noise amplifier. In the "Introduction to the Meteosat System" published by E.S.A. a G/T of 11.5 Db/kelvin is recommended. To achieve this figure it would be it necessary to use a prime focus dish antenna considerably larger than 3 meters in diameter with the combined low noise amplifier with a noise figure better than 1.5 Db.

(This link budget is estimated for a complete ground station for commercial purposes).

Excellent results have been obtained from systems using smaller dish diameters and lower noise figure L.N.A.s. After reception the receiver will be followed by a phase demodulator, after which the data will be conditioned and filtered and all the timing bits extracted. Developments in hardware and software, processing and information storage techniques have advanced quite considerably in the past few years. Most of us will have access or even possess P.C.s capable processing and data handling at increasingly faster speeds. Memory integrated circuits become increasing faster and cheaper. The options for the user at this stage have become much greater. It is here that should the reader require any further information on the image processing and data collection hardware and software techniques he is advised to read the numerous publications available from the European Space Administration on the desired area of interest.

List of documentation available form the European Space Administration, Meteosat Data Management Department, European Space Operations Centre, Robert Bosch Strasse No 5, Darmstadt, F.R. Germany.

BOB SANSONI, G4MWR

The YU3UMV Frame Store versus Computer Systems for APT

by Roger Barker, G4IDE

This article was prompted partly by Peter Newman's article in Newsletter No. 15, and partly by an advert in RadCom for a computer based Meteosat picture system costing a mere £1,695!

Perhaps I should first make my own particular standpoint clear. I am by profession a PC software engineer. By hobby I am a radio amateur. For several years I have been producing software to enable computers to enhance my hobby. I think I have covered just about everything possible - CW, RTTY, Slowscan, AMTOR, Fax and APT. I have drawn the line at Packet, for which I have a particular personal dislike.

One thing has become very obvious from my involvement with ham radio computer systems. This is that a computer is not the best tool for some of the above modes. It is an unfortunate fact, however, that a skilled programmer can hide the basic short comings of a system by supplying lots of gimmick features. I know this is true, because I myself have been guilty of it!

The basic feature of an APT system must be to produce good pictures. It's nice to have a mouse and zooming and windows and processing and scrolling and ....., but are the pictures any good? Stand most computer systems alongside a frame store and the honest answer is quite obviously no.

My first APT system was implemented using a Spectrum. It had lots of gimmicks - on screen clock, picture save to memory, variable picture width and contrast etc. - but quite honestly the pictures were rubbish; although they were quite a lot better than some BBC systems that I have seen. Spectrum owners who saw it thought it was wonderful, simply because they had never seen a decent APT picture.

Having seen a friend's YU3UMV frame store, I knew that my Spectrum system was totally unsatisfactory, so I decided to build a frame store for myself. I was lucky, it worked more or less OK from the start, and I still think the results are superb. Building a frame store, however, is not within everyone's capabilities, and I think it is unfortunate that, over the years, the emphasis has been on adding gimmicks (shades of computer systems!) to the basic design. It would have better if some effort had gone into making the thing more easily reproducible by those less skilled in electronics.

Until the beginning of 1988 my professional work on PC's involved only monochrome graphics. There are some very clever ways of simulating grey levels with a monochrome system, but the results are not really to be taken seriously. Early in 1988 I started to develop systems using EGA colour graphics and it soon became obvious that the resolution and colours available might be good enough to produce satisfactory APT pictures. The PC that I was using, by the way, was a Tandon PCA40 (IBM PC-AT compatible) with an 80286 processor running at 10 MHz.

Rather than construct a special interface, I 'tapped' the data off from my frame store using the serial link between the two boards. The technique was explained by Hans Oppermann in VHF Communications, 3/87. I finished up with a serial data stream at 19,200 bps, which I got into the PC via the standard communications port. The software inputs the data at a resolution of 600 pixels per line, and will write it to disk while simultaneously displaying it on the screen. It can then be recalled and viewed at three different zoom levels. The 16 colours used for the display are changeable while a picture is on the screen as is the brightness of the picture. Pictures can be dumped to a Hewlett Packard Laserjet or compatible printer with synthesised grey scale. The results are sufficiently good that even seasoned PC software engineers are fairly impressed, but alongside the frame store, quite honestly, it's still rubbish.

At this point it is probably worth defining what the two important IBM PC graphics standards - EGA and VGA - actually offer, since this seems to be a point of confusion.

An EGA board with the normal complement of 256k of video RAM gives two graphics pages. Each page has a maximum resolution of 640 by 350 pixels. This gives a display aspect ratio of around 1.3:1, which means that a true circle appears like an egg stood on its end. 16 colours can be displayed simultaneously, and they can be any 16 from a palette of 64. The choice of which 16 colours are used can be changed while a picture is being displayed. There are some advanced programming techniques that can be applied to the EGA board. One particularly effective technique is to resize the video buffer to something larger than 640 by 350. For example, I have recently produced a system which sizes the buffer to 896 by 580 pixels. The actual screen then becomes a view window which can be very smoothly moved round within the larger area.

Unless an EGA is used with a special monitor which gives grey levels rather than colours, APT pictures must be displayed using artificial colour instead of grey levels. No matter how hard you try, and I have tried very hard indeed, you cannot get realistic pictures.

Along with the new PS2 PC's, IBM introduced a new graphics standard - VGA. This is essentially a superset of EGA, but it has some differences which are very significant for APT systems. The maximum resolution is 640 by 480 which gives a display aspect ratio of 1:1, circles are actually round on a VGA screen! There are still two pages available, but now the 16 colours are from a nominal palette of 256. There is also a lower resolution mode of 320 by 200 pixels which allows 256 different colours to be displayed. One major change compared to EGA is that the RGB specification for each palette colour is programmable; this results in a the total number of colour variations possible being no less than 64 x 64 x 64 - a very big number!

This number of colours is not an awful lot of use. In practice, with the average monitor, it is difficult to see any difference between some of the 64 colours available on an EGA, yet alone this huge number available on a VGA. The important thing is that by programming sixteen colours with equal but gradually increasing amounts of red, green and blue, it is possible to produce a palette which gives a display in sixteen grey levels. Also, because the amount of R, G, and B in each colour is variable in units of 1/64, the steps between the grey levels can be very finely tuned to give very smooth transitions from one grey level to the next.

I have recently had the opportunity to modify my system to use a VGA board. The improvement that sixteen good grey levels gives compared to sixteen colours is quite fantastic. My system now has the ability to change from colours to grey while a picture is on the screen. The effect is profoundly educational. The higher resolution of the VGA monitor compared to the frame store, combined with the great linearity of the grey scale, plus the fact that the grey levels can be varied to compensate for different seasons, satellites etc. means that the pictures on the VGA system now seriously challenge the frame store.

BUT... I bought my frame store PCB's from RIG for a few pounds. The components came from Martelec for about £80. I already had a case and power supply components, but even if I had bought these the total cost would only have been around £110. On top of this there is the cost of a monitor - say £30 to £100 depending on how new it is! The Tandon PCA 40 with VGA card and monitor, if I had to buy it, would cost around £1,700; then I would need an interface - say another £50. On top of this there would be software to purchase.

My conclusion - don't go for a computer system without carefully considering what it will cost and what the results will be like. In general, colour systems are unsatisfactory, since whatever the adverts say, the results are unrealistic, and always will be until APT pictures are transmitted in colour! The ability to do wonderful gimmicky things with the picture will never make up for this fundamental inadequacy. A VGA system which utilises the ability of the board to produce sixteen grey levels can rival the frame store - but you will need a mighty deep pocket! Nothing can yet challenge the frame store in terms of price versus performance - so who's going to volunteer to re-engineer it and make it easier to build?

HAVING FUN WITH SATFOOT
Ken Willis, G8VR

Since not all dedicated weather satellite watchers are radio amateurs, there may be some who do not know the excellent piece of software named SATFOOT, written by James miller G3RUH for the BBC and Electron micro's and available in dual format 80/40 disc from AMSAT-UK, 94 Herongate Road, London.

This program display the footprinting of up to ten satellites either individually or simultaneously on a mercatorial projection of a map centred approximately on the U.K.. An antipodes map is also provided. After loading the keps for your chosen satellites, and setting the date and time, you just sit back and watch the display operating in real time. When a footprint, displayed normally as a ring, embraces your part of the map, the satellite should be in range.
Below the map, continuously up dated figures for range, elevation and azimuth of the satellite are provided. It is great fun to watch a satellite come up from below the equator and gradually come into range of the U.K. I have found that with Keps well over two months old, the accuracy is amazing. As soon as the elevation reading goes positive, if the satellite is switched on, signals start to be received. Although the program runs in real time, there are facilities for advancing or retarding the date and time, so it is possible to look ahead and actually see when a particular @bird@ will be in range of your station, or alternatively to go back in time to check an earlier orbit. The program also displays current orbit numbers, counted from the epoch revolution related to the Keps loaded, useful for checking against other data occasionally to ensure that all is running according to plan.

Another use I have found for SATFOOT is the identification of satellites. My receiver is an old Eddystone 770R general coverage VHF receiver (all valves) to which I have added three stages of solid state pre amplification. It has avery long and wide scale, calibrated in six frequency ranges, and superbly engineered slow motion tuning drive, but no digital readout, so while tuning at 137 MHz it is easy, no accurate frequency readings are possible.

Hearing a NOAA type signal at an unexpected time, a quick run through on SATFOOT showed it to be NOAA-9 which I had assumed to be kaput (it may will be by now since it was missing every fourth beat at the time, and next day to). Similarly, hoping to hear Fen Yung signals, I can see at a glance when it should be over head, so I can pop out to the post box and not miss a possible pass. I know that this is all possible with programs which print out tables of times elevations and azimuths, but for me, seeing the overall picture with the positions of a group of weather satellite displayed in real time on a map is much more interesting an meaningful.

Finally, hearing an unexpected signal outside the carefully selected EQX times which I had planned to monitor, SATFOOT soon revealed that it was NOAA-11 at extreme range over Western Russia, its footprint just brushing the U.K. Sure enough, shortly after the footprint cleared my area, signals disappeared.
Students of propagation will be quick to note the value of this program in identifying satellite signals from over the horizon.
One problem, if your micro generates a lot of hash, it might not be possible to run SATFOOT while monitoring satellites. Mine is the much derided Acorn Electron, chosen as my word processor because of its excellent keyboard. It produces a birdie in the middle of the weather satellite band, but mostly I can run the computer and watch satellites come into range. I tend to leave it running all day, so a glance at the screen is all that is needed to tell me whether I should drop what I am doing and prepare for a pass.

Doubtless there are other programs which offer the same facilities, but for me, this is an amazing and very useful piece of software and my congratulations to James Miller for conceiving it.

BEGINNERS GUIDE by Henry Neale
PART TWO

Yes I know it's been a long time since the end of part one but miracles just take a little longer nowadays, it's inflation you know. Where did we get to last time, yes I remember, it was those funny bleeping noises that got on everybody's nerves, and all those tapes that you were making, that had those pretty pictures on them, if you had the right equipment. Well what are you going to do about it? I don't know comes the unanimous reply! Well it depends on the usual commodities that we are all always short of, time and money. If it's a case of pass the cheque book James then probably the top of the range will be the Dartcom Nimbus system. Coming close on it's heels, especially if you are a computer buff, are the more recent generation of computers like the Archimedes, the Amiga or the Atari ST, which, with an interface will give very dramatic and enlightening results. If you are like myself and need to do it all initially on a shoe-string, then the options available are somewhat limited. However the following might be of some help or at least give you some inspiration.

According to our records, there are quite a lot of our members who own or have access to BBC computers. These will give worthwhile but limited results. At present they all need an interface or digitizer as some are called. They usually give only 4 or 8 grey levels and typically offer an image resolution of 128 X 128 pixels. A pixel being the smallest size viewable on the screen. All in all they are quite a good starter, if you are semi-familiar with the overall systems. The interface and software are not very expensive but can cost about £100.

For a similar sum it might be possible to buy from the various Emporiums a redundant FAX machine. These are not always suitable, so their specification should be studied together with their running costs. The Telecopier 400 type machines also emit a rather vile pugnant smell which will not go down well with the other members of the household. Most telephone FAX machines work at 180 lines per minute and to convert them to either 120 or 240 lines is not a task to be taken on by the faint-hearted or the non technically minded.

However with care they can be converted and they do produce quite passable results. By the way, I forgot to mention that the I. O. C. (index of co-operation, the distance between successive lines) might need to be altered considerably otherwise you could have short fat pictures or thin long ones. Some machines use a frequency modulation system, but this need not worry you too much as they all have to convert the signal to an amplitude signal before it goes to the display itself.

You just have to find out where. The early machines used an amplitude modulation system and all you have to do then is feed that bleeping noise into the input.

Then, Hey Presto, if the machine is a 120 or 240 lines per minute out comes a weather satellite picture, except it is in inverse form, ie maximum signal gives maximum black not white.

Suitable machines are difficult to come by and there aren't many advertised anywhere. John's Radio up North is about the only one that I know of, who has dealt in machines in the past. I don't know what the present situation is like. It's probably worth a phone call but not everybody at once! The cost in the past is usually in the £50 to £100 range and the results can be very good, definition is very high but the grey levels tend to be rather limited (about 12 to 16). Don't forget to find out how much they cost to run ie paper costs and availability. Overall these machines tend to be good buys if you can find a good one that doesn't need many modifications and works well but there are some machines that need an awful lot of work on them and then only produce mediocre results.

There are several different types of FAX machine, some use moist electrolytic paper ie. the early Muirhead machines. Others use a paper that has the surface arc'd or burnt off to reveal the black under-layer. Current day machines use a technique similar to photocopiers and dry toner. The earlier Muirhead machines had a novel system of a single turn helix edge, made of a silver alloy (very expensive), to scan against a fixed writing edge. Where the helix and writing edge touched (with the moist paper in between) current was passed through the paper. This current removed metal from the fixed writing edge and chemically marked the paper, the more current the darker the mark. The writing edge has to be replaced periodically. In the larger 19 inch machines the helix was approximately 6 inches in diameter and only had one turn in the full 19 inches width. The fixed edge was made of a metal similar to stainless steel and relatively inexpensive. Through the window provided you can actually see the image being built up line by line.

Other systems use a rotating drum and a carriage that carries the writing head which gradually travels along the drum. If the system uses photographic methods then a light sensitive paper is wrapped around the drum and a system of lenses and a variable light source is mounted on a carriage. The drum is rotated and the small focused spot of modulated light is slowly scanned along the full length of paper by the carriage. This all takes place in a light proof environment. After an image has been exposed, the paper is developed and fixed, as in normal photographic systems.

Replacement of the light sensitive paper by the telecopier 400 type of paper on the drum, and replacement of the modulated light source plus lenses by an insulated stylus which burns the white surface layer off, gives a lower quality result but no messing about in the dark-room and instant results once the machine has stopped.

Framestores such as the one designed by YU3UMV are typical of the systems used by over half the RIG membership. Costing in the region of £100 but the construction and getting going is definitely not for those of a weaker disposition or non technically minded. The cost is not prohibitive nor is the actual construction. They form a complex piece of electronic equipment. However once they are working they tend to be very reliable if nothing nasty happens to them. Turned pin sockets for every integrated circuit is essential and everything needs to be checked and checked again. The main problems with framestores is simply getting them going! Once working they seem to go on and on and on! Somebody somewhere ought to trace out all the supply and earth tracks because the majority of faults are mainly unconnected supply and 0volt lines.

Hopefully I haven't put you off building, or buying a commercially made framestore because they do produce very good results - 256 X 256 at 64 grey levels. Their only snag is that they do not produce hard copy and the only way around that is to take a photograph of the video monitor.

There are higher definition versions ie. 512 X 512 at 128 grey levels, or more, now becoming available. For those of you still with me who want the ultimate in copy then the photographic drum machine is the one to look out for. They are usually home-made but some ex-wire service machines have been heard of. All the previous comments still apply. They produce incredible quality pictures and this type of display is the usual source for our centre pictures which do not do them justice but we are working on that problem.

I don't know what subjects to cover in any subsequent episodes. As we haven't published a step by step guide to constructing a YU3UMV framestore, perhaps that would be the logical step. If there are any other subjects you would like to read more about please inform me or the Hon Sec and we will see if we can get something done about it.

The Russian and Chinese Satellite Scene
by Les Currington G8LOK

It seems a very short period since I was writing my last Newsletter in RIG 15 and at the time of writing on the on the 22nd Feb only two Meteors are still operating but with no spectacular pictures to report due to lack of frost and snow; with the exception of central Europe which has been blanketed with fog.

When receiving pictures of all weather satellites during a period from the 16th to the 23rd of January it was practically impossible to receive any stable signals north of Iceland without getting severe fading; in fact the fluctuating signal strength was so great that a possible fault was suspected on an aerial.

After reading several reports of a similar nature it dawned on me that we approaching a sun spot maximum. For newcomers to satellite radio observing it would be appropriate to remind members that we are approaching a max solar phenomena which could result in unusual reception conditions.

Sun spots numbers have been increasing recently with a large increase in solar flux (noise); this 11 year cycle is well known and will possibly reach a peak in the coming year, when we could be seeing large variations in satellite reception, especially as this peak looks like peaking above recent recorded maximum.

Meteor 2/16 87-68A 137.4 MHz

Meteor 2/16 is now in a ascending early morning pass and giving good pictures. A print taken in March 1988 appears on the centre page.

Meteor 2/17 88-05 137.3 MHz

Meteor 2/17 should be in a good position by the end of March to show any late snow fall, it is now in a asending afternoon pass.

Meteor 3/02 88-64A 137.85 MHz

Since reporting in the last newsletter that Meteor 3/02 had ceased operating, transmissions resumed again at the beginning of December and some excellent passes were seen.

On several evenings excellent IR pictures were received from an area extending from the Red Sea up to the west coast of Greenland; the Greek Islands showing up in great detail.
But alas this was the end, at about the 8th of February signals became very intermittent and on the 9th of February only sync and black level were transmitted.

On February the 14th while awaiting a Met 2/16 transmission a Meteor signal appeared on 137.4 MHz, on checking orbital data this was found to be Meteor 3/02 this was also confirmed by Gordon Train in Keswick, Lawrence Harris in Plymouth and verified by Geoff Perry; since the 15th of February nothing more has been heard.
It is my opinion that this meteor has not been functioning correctly since the launch. Maybe we can look forward to a new Meteor 3.

Late news on Met 3/02:
Geoff Perry reports that Met 3/02 is back on again

Feng Yun 1988 80A

One of the few pictures received on the 8th of September during the afternoon pass from Feng Yun are shown in this issue of RIG.
The last transmissions of Feng Yun were logged by a member of the Kettering group Dave Hawkins and a report can be found on page 63.

Okean 1988 88-56A 137.4 MHz

During February Okean has been heard on a pass covering the mid Atlantic; on one occasion transmissions commenced near the west coast of Africa and switched off on reaching the south coast of the UK.
Gordon Train also reports a good pass covering the length of Norway on the 7th of February.

Meteor 2-18

Late news from the editor.

Launched in February this is a new Meteor designated Meteor 2-18.

It has been observed that this satellite is transmitting 20 lpm I.R. pictures through the night. (any suggestions for framestore mods to the editor)

More news to follow.

KEPLER ELEMENTS provided by Max White
ROYAL GREENWICH OBSERVATORY,
HERSTMONCEAUX CASTLE

	NOAA 9 137.62 MHz 84-123 A	MET 2-17 137.30 MHz 88-05 A
EPOCH OF DATA	89063.68378242	89063.79127606
ACCELERATION	0.00000733	0.00000324
REV NO	3392	892
INCLINATION	99.1351	82.5431
R. A. NODE	48.6326	3.5103
ECCENTRICITY	0.0014333	0.0015930
ARG OF PERIGEE	246.4287	198.5135
MEAN ANOMALY	113.5380	161.5455
MEAN MOTION	14.11866364	13.84105095
SEMI MAJOR AXIS		

	COSMOS 1766 137.4 MHz 86-55 A	NOAA 11 137.62 MHz 88-89 A	NOAA 10 137.50 MHz 86-73 A
EPOCH OF DATA	89064.60157950	89064.74012887	89065.07029446
ACCELERATION	0.00003104	0.00000795	0.00000713
REV NO	5385	513	1986
INCLINATION	82.5259	98.9286	98.6494
R. A. NODE	133.6994	9.3098	97.4845
ECCENTRICITY	0.0025166	0.0012294	0.0013313
ARG OF PERIGEE	77.9154	159.5045	185.3337
MEAN ANOMALY	282.4828	200.6624	174.7703
MEAN MOTION	14.74659511	14.10850889	14.22848830
SEMI MAJOR AXIS			

	MET 2-18 137.3 MHz 89-18	MET 2-16 137.4 MHz 87-68 A
EPOCH OF DATA	89064.00231688	89064.04956588
ACCELERATION	0.00000117	0.00000249
REV NO	116	2478
INCLINATION	82.5185	82.5573
R. A. NODE	242.1954	302.0577
ECCENTRICITY	0.0013415	0.0012969
ARG OF PERIGEE	238.1615	123.1953
MEAN ANOMALY	121.8239	237.0445
MEAN MOTION	13.83754715	13.83435930
SEMI MAJOR AXIS		

	OKEAN 137.4 MHz 88-56 A	MET 3-02 137.3 MHz 88-64 A
EPOCH OF DATA	89065.64794932	89065.04386339
ACCELERATION	0.00002900	0.00000391
REV NO	3003	1467
INCLINATION	82.5143	82.5385
R. A. NODE	231.3464	248.6473
ECCENTRICITY	0.0022790	0.0017375
ARG OF PERIGEE	202.2787	79.4691
MEAN ANOMALY	157.7062	280.8154
MEAN MOTION	14.74123573	13.16853976
SEMI MAJOR AXIS		

More observations from Gordon Train

Just a few notes about my observations of Meteor 3/02. You've proberly noticed them yourself but I thought I'd put them in writing just incase.

I received some excellent IR pictures (modified my software to invert them) from the evening/night passes. I'd received the day time visible pictures a few times and was interested to see the change from vis to IR took a long time (eg 1-2 minutes of black and sync) on reaching darkness. Listening on the 9th of February the change was instant but that evening came the bad news, no IR picture only black and syncs on all passes.

The next few nights and there was no signal on 137.85 MHz

The next chance I had for a day pass was 13th of February. The 0911 hrs picture started well, but half way through it stopped (apture not fully open) and the signal became continious 2.4 khz tone (white pictures) all passes that day and night were continious tone.

Today the 14th of February I waited but no 0850 hrs picture, not even a carrier. At 0858 hrs I found a picture on 137.4 mhz, (not 2.16 that arrived at 0938), it lasted untill 0903 hrs and then switched off. It returned at 1047 hrs on 137.4 mhz switching off at 1053 hrs.

I'm no expert on these matters but it looks to me that Met 3/02 has lost its IR and the visible has changed to 137.4mhz.
We wait and see !

Gordon Train.

The Eddystone 770R Receiver
by Ken Willis G8VR

Older Amateurs and SWL's will remember the Eddystone range of communication receivers built by Stratton and Co, of Birmingham. Eddystone receivers were noted for their performance and quality in the years before WW 2 and up to the 1960's when the Japanese black boxes started to saturate world markets.

These early Eddystone receivers were characterised by their black crystalline-finished cabinet with smoothly curved corners, heavy die-cast front panels, stylish knobs associated with backlash-free gear trains on turning controls, and much evidence of good engineering throughout. They paid the penalty in weight, but because of their robust construction and ease of servicing, many of the early receivers in the Eddystone range are still in use today. Government agencies and the armed services were major customers of the Stratton Company, and as a result certain types of receiver much as the Eddystone 770R have found there way into private use as these agencies replaced them with more modern receivers.

The Eddystone 770R is an all valve general coverage VHF receiver designed for intercept work in the years before transistors became the vogue. With such receivers, VHF performance is limited by the rather high noise figures resulting from the use of valve front ends. When the valves are used, triode circuits can be designed to provide the best noise performance, but at a small increase of noise figure, the RF pentode offers a better solution for a manufacturer making mass produced receivers since the inclusion of the screen-grid electrode makes the stage inherently stable. The 6AK5 low noise RF pentode was specially designed for this purpose and the 770R uses three of them, for RF amplifier, mixer and local oscillator.

There is, incidentally, a UHF version of the receiver, the 770U, which at first glance could be mistaken of the 770R except that the dial readings will clearly indicate the model. All valves used in the 770R are currently available from stock from reasonable prices.

The 770R covers 27 MHz to 165 MHz in six ranges. Coils for each range are built into a massive rotating turret, so that the RF, mixer and local oscillator coils are actually inserted into position when changing range instead of being switched in a more conventional way. This reduces lead-lengths in the front end circuits, particularly important at the higher frequency end of the coverage. Tuning is relatively easy since the receiver is equipped with a dial 13 inches long and 4 inches wide. The turning-gear-train is very smooth, and to assist logging, there is a bandspread dial calibrated 0-100.

The top range covers 105-165 MHz, and on this range while some frequency drift is inevitable with a self excited valve local oscillator, this is minimal when the receiver is thoroughly warmed up.

The receiver provides facilities for OW,AM,FM, (wideband for broadcast) and FM (narrow band). The narrow band FM is approximately 20KHz wide, on the face of it too narrow for weather satellite reception. However there are no filters in the receiver as we understand them today, so the actual bandwidth depends very much on how the 4 IF stages (at 5.2 MHz) and the FM discriminator transformer are peaked. There are no less than 12 tuned circuits at 5.2 MHz, so at the sacrifice of some gain, the band width can be made somewhat greater by 'stagger' tuning.

I have used one of these receiver for some years for sporadic E monitoring and general VHF checking. By present day standards it is a very deaf receiver, which is unimportant when monitoring Es, since such signals tend to be strong when this propagation is present. About a year ago I started to investigate how effective the receiver would be receiving weather satellites. Using a vertical dipole cut to 137MHz the satellites were received when in range, but not nearly well enough for good pictures to be obtained. I added a preamplifier using two J310 FET's,which improved matters, and finally I built a 3-stage FET pre amplifier, which transformed the receiver. Now when used in conjunction with a home brew indoor turnstile antenna with reflectors, I get very good pictures from North Africa until the signal satellite goes out of range in the north.

What, then, are the advantages, if any, of using a receiver of this type for the WX sats? The first one is coast, since the current market value of these receivers is under 100 pounds, and for this you get a receiver which has many uses besides satellite reception, not the least superb FM broadcast reception through the use of a push pull pentode audio output stage delivering four watts (mono) to the speaker. In addition, the 770R is useful for monitoring local 144 MHz repeaters, and for checking the muf as the solar cycle moves towards its peak. It also covers the aircraft and marine vhf bands, and even CB at the bottom end! You can get a soldering iron around it, too, or change a valve, a far cry from so many of the Japanese boxes of today.

Next, the narrower bandwidth, though reducing picture definition slightly can be a great help in rejecting near by interference. I can receive clean pictures while my son's Martelec MRS 20 receiver is being wiped out by what appears to be a paging system.

Some minor tuning during a pass is sometimes required because of Doppler shift.

It is usually obvious simply by listening to the signal when a small adjustment is required. If this is made to abruptly, a line occurs on the picture due to a change in the level of the audio fed to the YU3 framestore, but this can be avoided with a little experience and practice.

Another interesting feature of the receiver is that one can switch to the AM or CW modes to monitor satellites, since with the added sensitivity this provides, they can often be heard 'over the horizon' prior to coming into 'visual range'.

Finally, the wide frequency coverage of the receiver enables a search to be made for satellites outside the 137 MHz band, although for this to be really effective pre amplifiers tuned to the appropriate frequencies would need to be added to increase sensitivity.

There is no doubt that a dedicated WX satellite receiver embodying all the latest filtering and scanning techniques will produce the best pictures, all else being equal. However, not everyone may not wish to tie up capital in a receiver which has no other applications, so 770R is an alternative which may appeal to some.
They are frequently offered for sale through member's advertisements in the radio press, and occasionally by dealers. I got mine for about 80 pounds, though recently I have seen them advertised at prices lower than this. I have the full technical specification, circuit and service information for the receiver should anyone require them.

A LOOK AT THE MSS20 by Will Rimell

This four-inch square board derives its +5v supply from the BBC computer and generates its -5v from an inboard ICL7660 chip. These are nominal values, and the +5 filters through at +4.65 and the negative comes to about -4.5, depending on the setting of the black level. Apart from the supply components there are three separate circuits, of which the analogue to digital (A/D) converter is the only one to use the minus voltage.

The circuit ending with A/D has a line of four op-amps leading up to it, and the third of these acts as a full wave rectifier to the 2400 Hz signal. Here the waveform showed the inverted humps to be only two-thirds the height of the others. Resistor values to redress the balance proved awkward. I noticed another design, Maplin I think, only had a half-wave rectifier, so I left mine alone; after all, two-thirds must be better than nothing.

The second of the circuits is simply a 2400 Hz xtal oscillator and it provides a sync signal for putting on the second track if the recorder is stereo. A test on a mono showed square waves going in and sine waves coming out.

The last part of the board was where the oscilloscope proved its value. The circuit has a bandpass op-amp, followed by the flywheel-action of a phase lock loop (PLL), a counter/divider, and finally a pulse-shaping output chip feeding the acknowledge pin of the BBC printer port. The action of this pulse is to trigger the motion of the spot across the screen. Sounds complicated ? Not really. Trouble appears if either extra pulses get through (noise) or pulses are left out (fading signal). Broadly speaking, the op-amp reduces the noise and the PLL tries to keep up an even rhythm despite variations in what comes in.

Using the listed component values I calculated the bandpass to be centred on 2130 Hz with width 110 Hz (for voltage cut by half). The scope showed 110 about right, but it was centred on 2140 Hz and clearly unsatisfactory. My remedy was changing the 390k feedback resistor to 330k which moved the middle to a satisfactory 2350 Hz. The PLL was a bigger headache. Adjusting VR1 on the 4046 pin 11 would not bring the frequency below 2900 Hz. Small changes in the pin 6/7 cap. had a larger effect than expected; a 40pF silver mica in parallel across the original 680pF brought the 2400 Hz into full adjustment of VR1.

Recordings which had previously slewed across the screen became righted, though only for those which had been made by the same machine. The interface now functions whereas it didn't before, but the limited capture ratio of the PLL cannot cope when I try to decode a friend's tape. Perhaps this weakness could be put down to the 4046 being powered below five volts ? My next step is to lower the noise from the receiver.

Will Rimell
10 Feb 89.

Cirkit Receiver Mods by GORDON TRAIN

Following my letter to you recently regarding unwanted signals on my weather satellite receiver (Cirkit Kit) . I decided to investigate the problem further.

Measuring the IF pass band response of the modified receiver I obtained a result of 50 KHz bandwidth measured at the 6db points, and a stop band figure of up to 70db. These figures are obvious impressive, mainly due to the 4 ceramic 50 KHz filters. But still I am getting unwanted signals. Using a signal generator I measured the receiver rejection of frequencies around the satellite channel and found that it would receive some unwanted frequencies.

For example:-

Receiving on 137.3 MHz channel, I could only get a rejection of -40 db on 138.99 MHz. There was reception on other frequencies between 135 and 150 MHz.
Taking the frequency of 138.99 I began to calculate where the problem lies.

The Cirkit receiver uses a crystal of around 14MHz and multiples this up to produce the local oscillator. In the case of 137.3 the crystal is 14.06666MHz. The multiplier chain therefore produces lots of harmonics of this and tries to filter out the 9th (126.60 MHz = 137.30 - 10.71 MHz IF.).

Some of the other harmonics are 112.533, 140.666, 154.733

Now from the formulae for the mixer the products are f1-f2 and f1+f2 but there are also none-linear products of 2f1-f2 and 2f2-f1.(there are others as you'll know but these are the closest to the satellite band.) and with the frequencies of 140.66 and 138.99 gives 142.34 and 137.32 MHz.

So a signal of 138.99 can produce a signal of 137.32 MHz which then mixes with the unwanted oscillator harmonic to produce an output at IF.
Looking at the output of the local oscillator chain showed that the ratio between the wanted harmonic (126.6) and the unwanted harmonic (140.66) was 40 db. Returning the oscillator chain produces a figure of 46 db at best.

This exercise can be repeated for the whole of the satellite band frequencies and can produce lots of mixer products, but unless you've got a problem from unwanted signals there's not much reason to.

Unfortunately I have, this is a legitimate transmitter close by on 138.99 MHz and this can overcome my rejection of 40 db as it transmits 25 Watts. There is also another signal from the same source on 139.10 MHz, again 25 watts and if you repeat the above exercise trying to receive 137.40 MHz you get the same result!

Sorry if this has been a bit long winded but I am just trying to point out that not all unwanted reception can be put down to Racal and Mercury as some problems lie in the receiver design (and I am sure that Cirkit is not the only one to use this method). As for a solution I haven't got one yet but intend to try filtering out either the unwanted signals coming into the receiver or the unwanted oscillator harmonics into the mixer. Possibly also the problem is not helped by my modification to increase gain in the front end stages, but I can't imagine this is any worse than using a pre-amp with a gain up to 15 db as is common.

Well I hope this can help to explain some of those mysterious signals to anyone who has a similar problem.
NB
140.66MHz and 144.00MHz produces 147.34 and 137.32 MHz but that's another story.

Gordon continues the story with a further letter on 23 November 1988

Hopefully this is the last letter on interference! From my last letter I forgot to mention the " in band " products produced by mixing the unwanted frequencies from legitimate transmitters in the land mobile band (138Mhz 140 + MHz) They are mixed in the receiver, either by overloading the first stages of the receiver or in the mixer stage itself. If you get enough of those signals to produce more than one stage of mixing you can get lots of products "in-band"

Enclosed is a program showing my unwanted signals mixing including also mercury freq (137.175) but unfortunately I haven't got one yet! There are plenty of other frequencies used in the band 138-140 around the country so other people may have other mixer products.

The only way to remove this lot is to filter them out at the input. Racal/Mercury are best removed by improving the IF filtering (as people have started to do) This is because they're so close to the satellite band. Because the others are further away an R.F. filter should be best. It will need to be a fairly narrow passband filter to reject 139 MHz. I'd recommend my original mods to increase the gain in the receiver and improve noise figure as this can over come any loss in the R.F. filter which may be necessary to achieve a narrow bandwidth.

Meteosat Dissemination News No. 1/89

The following is a precis of a newsletter sent to me from Weatherwatch. The first part concerns the aerial problem already covered in RIG15 pages 34 & 35. It continues by stating that Meteosat 4 (MOP1) is on station and the high resolution image data will be different and changes will be implemented on 8th May from image slot 25. The new Meteosat image dissemination schedule will be introduced on the 1st June when M4 becomes operational. It contains the following changes...

Change in use of dissemination channels.
Increase in GOES image relay transmissions.
No more ranging slots.
Limit of one test image.

Wefax transmissions currently using 1694.5 MHZ will be transferred to 1691.0 MHZ. This also applies to the DCP retransmissions. The Wefax transmissions currently on 1691 MHZ will be transferred 1694.5 MHZ.

These changes will take place on the 1st June 1989. Users have requested an increase in the number of GOES images relayed by Meteosat, and this will also be enacted upon from 1st June. The disappearance of the old ranging slots will be an added bonus. The use of a new ranging technique resuits in an additional 32 image slots per day. The new test image (test 0) was introduced in 1988. This test image is digitally edited and contains all information necessary for the check out of user equipment, i.e. a graphical pattern, a calibrated grey scale and test information. The old Test 4 (grey scale) is no longer required and will be terminated. Both digital high resolution and analogue Wefax image transmissions will continue from MOP satellites until at least 1995. Some tests of other types of transmission, i.e. digital WEFAX, compressed imagery, may take place over the next one or two years. Sufficient advance notice will be given of any permanent changes. Users of Meteosat 4 will notice a change in signal level when compared with the earlier satellites. This is a small change and is the result of the addition of the Meteorological Data Distribution system which shares the available power of one of the transponders. There is no change in the original RF link budget specification. G/T for PDUS is +10.5 DB/K and SDUS +2.5 DB/K. Provided your equipment is up to this specification there will be no degradation of the image reception quality from the MOP satellites. High resolution data users will be provided with more data than is available at present and will all be coded in 8 bits. Although the raw data from the satellite is increased to 333 kbits/s, the high resolution image data to PDUS operators will remain at 166 kbit/s. In order to provide users with additional image data, data compression methods are now being studied and tests may be carried out later in the year using spare dissemination slots. Compressed images will only be transmitted on an operational basis after all tests have been successfully completed. Advanced warning of permanent inclusion will be given. Further details of the new transmission schedules can be obtained from Weatherwatch (hopefully we will include it in the next newsletter). Other details can be obtained from EUMETSAT

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NOAA '10' PERIOD 101.2629185534317 MINS
INCR 25.3160318641167 DEG

1/04 351 19:01	1/05 184 07:51	31/05 346 18:38	29/06 184 07:51
2/04 346 18:38	1/05 336 17:59	1/06 188 08:08	29/06 336 17:58
3/04 188 08:08	2/05 330 17:36	1/06 340 18:16	30/06 330 17:36
3/04 340 18:16	3/05 350 18:55	2/06 183 07:46	1/07 350 18:55
4/04 183 07:46	4/05 344 18:33	2/06 335 17:53	2/07 345 18:32
4/04 334 17:54	5/05 187 08:03	3/06 354 19:12	3/07 187 08:03
5/04 354 19:13	5/05 339 18:11	4/06 349 18:50	3/07 339 18:10
6/04 349 18:50	6/05 181 07:41	5/06 343 18:28	4/07 181 07:40
7/04 343 18:28	6/05 333 17:48	6/06 186 07:58	4/07 333 17:48
8/04 186 07:58	7/05 353 19:07	6/06 338 18:05	5/07 353 19:07
8/04 337 18:06	8/05 347 18:45	7/06 332 17:43	6/07 348 18:44
9/04 332 17:43	9/05 190 08:15	8/06 352 19:02	7/07 190 08:15
10/04 352 19:02	9/05 342 18:23	9/06 346 18:40	7/07 342 18:22
11/04 346 18:40	10/05 184 07:53	10/06 189 08:10	8/07 184 07:52
12/04 189 08:10	10/05 336 18:00	10/06 341 18:17	8/07 336 18:00
12/04 340 18:18	11/05 331 17:38	11/06 183 07:47	9/07 331 17:38
13/04 183 07:48	12/05 350 18:57	11/06 335 17:55	10/07 351 18:56
13/04 335 17:55	13/05 345 18:35	12/06 355 19:14	11/07 345 18:34
14/04 355 19:14	14/05 187 08:05	13/06 349 18:52	12/07 188 08:04
15/04 349 18:52	14/05 339 18:12	14/06 344 18:29	12/07 339 18:12
16/04 343 18:30	15/05 182 07:42	15/06 186 07:59	13/07 182 07:42
17/04 186 08:00	15/05 334 17:50	15/06 338 18:07	13/07 334 17:50
17/04 338 18:07	16/05 353 19:09	16/06 181 07:37	14/07 354 19:08
18/04 332 17:45	17/05 348 18:47	16/06 332 17:45	15/07 348 18:46
19/04 352 19:04	18/05 190 08:17	17/06 352 19:03	16/07 342 18:24
20/04 346 18:42	18/05 342 18:24	18/06 347 18:41	17/07 185 07:54
21/04 189 08:12	19/05 185 07:54	19/06 189 08:11	17/07 337 18:01
21/04 341 18:19	19/05 337 18:02	19/06 341 18:19	18/07 331 17:39
22/04 183 07:49	20/05 331 17:40	20/06 184 07:49	19/07 351 18:58
22/04 335 17:57	21/05 351 18:59	20/06 335 17:57	20/07 345 18:36
23/04 330 17:35	22/05 345 18:36	21/06 330 17:34	21/07 188 08:06
23/04 355 19:16	23/05 188 08:06	21/06 355 19:15	21/07 340 18:13
24/04 350 18:54	23/05 340 18:14	22/06 350 18:53	22/07 182 07:44
25/04 344 18:31	24/05 182 07:44	23/06 344 18:31	22/07 334 17:51
26/04 186 08:01	24/05 334 17:52	24/06 187 08:01	23/07 354 19:10
26/04 338 18:09	25/05 354 19:11	24/06 339 18:09	24/07 348 18:48
27/04 181 07:39	26/05 348 18:48	25/06 181 07:39	25/07 343 18:25
27/04 333 17:47	27/05 343 18:26	25/06 333 17:46	26/07 185 07:56
28/04 353 19:06	28/05 185 07:56	26/06 353 19:05	26/07 337 18:03
29/04 347 18:43	28/05 337 18:04	27/06 347 18:43	27/07 332 17:41
30/04 189 08:13	29/05 332 17:41	28/06 190 08:13	28/07 351 19:00
30/04 341 18:21	30/05 351 19:00	28/06 342 18:21	29/07 346 18:37

All morning passes are southbound, evening passes are northbound.

Frequency 137.50MHz. INCRement is degrees change per orbit.

NOAA '11' PERIOD 102.1205705179852 MINS
INCR 25.52957501389713 DEG

1/04 350 13:07	30/04 352 13:14	31/05 348 13:01	28/06 353 13:19
2/04 348 12:57	1/05 349 13:04	1/06 346 12:51	29/06 350 13:08
3/04 345 12:46	2/05 347 12:54	2/06 190 02:28	30/06 347 12:58
4/04 189 02:23	3/05 344 12:43	2/06 343 12:40	1/07 345 12:48
4/04 343 12:36	4/05 188 02:20	3/06 187 02:17	2/07 189 02:25
5/04 187 02:13	4/05 342 12:33	3/06 341 12:30	2/07 342 12:37
5/04 340 12:26	5/05 186 02:10	4/06 185 02:07	3/07 186 02:14
6/04 184 02:03	5/05 339 12:23	4/06 338 12:20	3/07 340 12:27
6/04 337 12:15	6/05 183 02:00	5/06 182 01:57	4/07 184 02:04
7/04 182 01:52	6/05 336 12:12	5/06 335 12:09	4/07 337 12:17
7/04 335 12:05	7/05 181 01:49	6/06 333 11:59	5/07 181 01:54
8/04 332 11:55	7/05 334 12:02	7/06 330 11:49	5/07 334 12:06
9/04 330 11:45	8/05 331 11:52	8/06 353 13:21	6/07 332 11:56
9/04 355 13:27	9/05 354 13:24	9/06 351 13:10	7/07 355 13:28
10/04 353 13:16	10/05 352 13:13	10/06 348 13:00	8/07 352 13:18
11/04 350 13:06	11/05 349 13:03	11/06 345 12:50	9/07 350 13:07
12/04 347 12:56	12/05 346 12:53	12/06 190 02:27	10/07 347 12:57
13/04 345 12:45	13/05 344 12:42	12/06 343 12:39	11/07 344 12:47
14/04 189 02:22	14/05 188 02:19	13/06 187 02:16	12/07 189 02:24
14/04 342 12:35	14/05 341 12:32	13/06 340 12:29	12/07 342 12:36
15/04 186 02:12	15/05 185 02:09	14/06 184 02:06	13/07 186 02:13
15/04 340 12:25	15/05 339 12:22	14/06 338 12:19	13/07 339 12:26
16/04 184 02:02	16/05 183 01:59	15/06 182 01:56	14/07 183 02:03
16/04 337 12:14	16/05 336 12:11	15/06 335 12:08	14/07 337 12:16
17/04 181 01:51	17/05 333 12:01	16/06 332 11:58	15/07 181 01:53
17/04 334 12:04	18/05 331 11:51	17/06 330 11:48	15/07 334 12:05
18/04 332 11:54	19/05 354 13:23	17/06 355 13:30	16/07 331 11:55
19/04 355 13:26	20/05 351 13:12	18/06 353 13:20	17/07 354 13:27
20/04 352 13:15	21/05 349 13:02	19/06 350 13:09	18/07 352 13:17
21/04 350 13:05	22/05 346 12:52	20/06 348 12:59	19/07 349 13:06
22/04 347 12:55	23/05 190 02:29	21/06 345 12:49	20/07 347 12:56
23/04 344 12:44	23/05 343 12:41	22/06 189 02:26	21/07 344 12:46
24/04 189 02:21	24/05 188 02:18	22/06 342 12:38	22/07 188 02:23
24/04 342 12:34	24/05 341 12:31	23/06 187 02:15	22/07 341 12:35
25/04 186 02:11	25/05 185 02:08	23/06 340 12:28	23/07 186 02:12
25/04 339 12:24	25/05 338 12:21	24/06 184 02:05	23/07 339 12:25
26/04 184 02:01	26/05 183 01:58	24/06 337 12:18	24/07 183 02:02
26/04 337 12:13	26/05 336 12:10	25/06 182 01:55	24/07 336 12:15
27/04 181 01:50	27/05 333 12:00	25/06 335 12:07	25/07 181 01:52
27/04 334 12:03	28/05 331 11:50	26/06 332 11:57	25/07 334 12:04
28/04 332 11:53	29/05 353 13:22	27/06 330 11:47	26/07 331 11:54
29/04 354 13:25	30/05 351 13:11	27/06 355 13:29	27/07 354 13:26

All morning passes are southbound, afternoon passes are northbound.

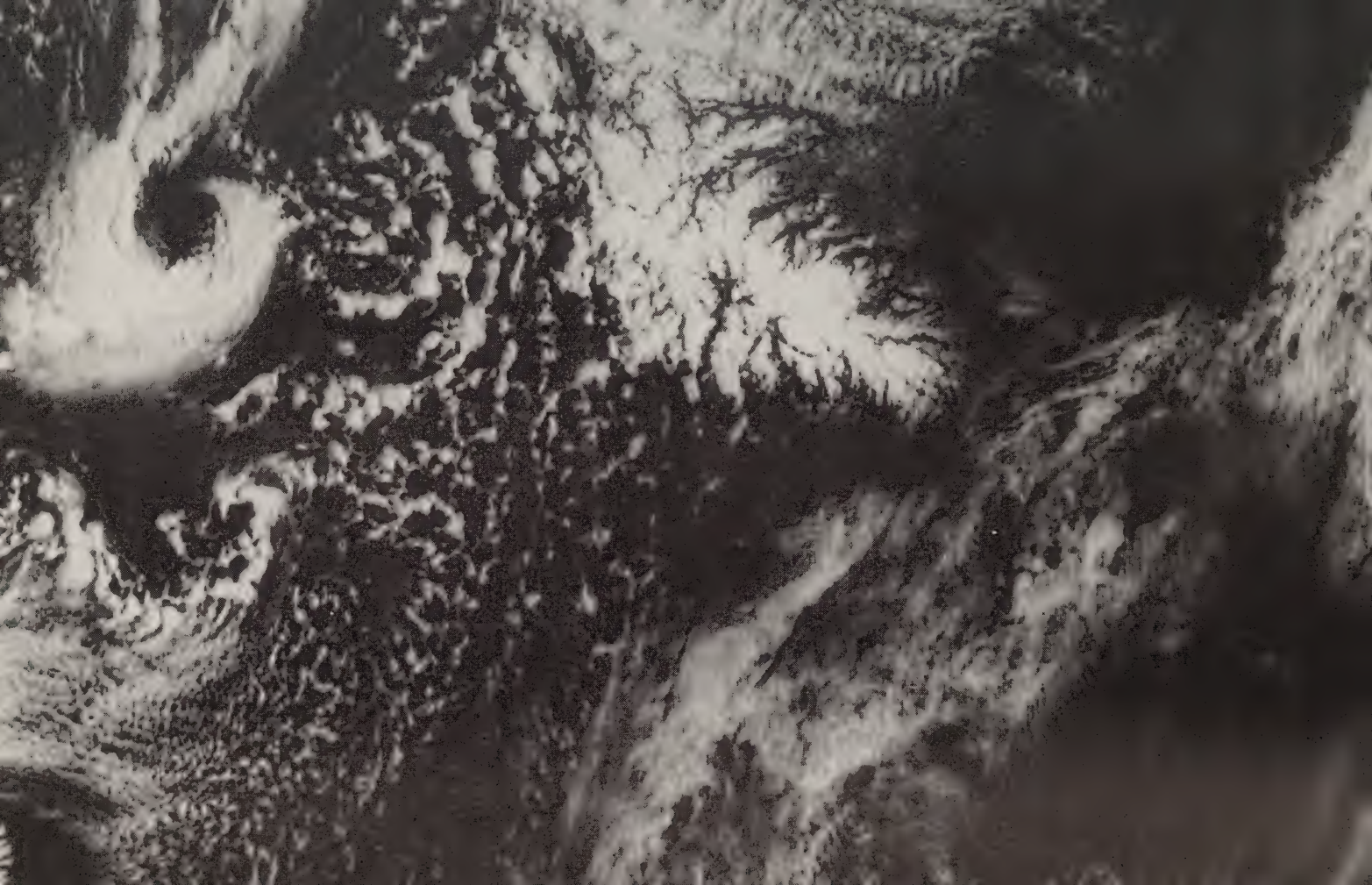
Frequency 137.62MHz. INCRement is degrees change per orbit.

Reference Orbit Data for Russian Satellites

Data is given for one orbit in each week for the five most commonly watched Russian Satellites. They are rounded to the nearest minute or degree and the figures for M2-18 are relatively immature and they may be inaccurate towards the end of this period. The figures are Northbound EQX time, EQX degrees, Orbit No.

	M2-16			M2-17			M2-18		
April 1	7-35	23	2855	11-29	20	1275	2-50	11	491
8	6-13	15	2951	10-02	11	1371	1-25	3	587
15	4-51	7	3047	8-35	2	1467	1-45	20	684
22	5-13	25	3155	8-53	19	1564	0-21	11	780
29	3-52	17	3241	7-26	9	1660	23-15	9	890
May 6	2-30	8	3337	7-43	26	1757	23-35	26	987
13	1-08	0	3433	6-17	17	1853	22-11	18	1083
20	1-30	18	3530	4-50	8	1950	20-46	9	1179
27	0-08	10	3626	5-07	24	2047	19-22	1	1275
June 3	23-04	8	3736	3-41	15	2143	19-42	18	1373
10	21-43	0	3832	2-14	6	2239	18-18	9	1469
17	22-05	18	3929	2-31	22	2336	16-54	1	1565
24	20-43	10	4025	1-05	13	2432	17-14	18	1662

	M3-02			OKEAN		
April 1	4-20	24	1811	2-27	19	3378
8	2-16	5	1903	0-37	4	3480
15	2-02	13	1995	0-25	14	3583
22	1-47	22	2087	23-01	9	3700
29	23-26	0	2191	22-49	19	3803
May 6	23-11	8	2283	20-59	5	3905
13	22-57	16	2375	20-47	15	4009
20	22-43	24	2467	20-34	25	4112
27	20-39	5	2558	18-44	11	4214
June 3	20-25	13	2650	18-32	21	4317
10	20-10	22	2742	16-42	7	4419
17	18-07	2	2833	16-30	17	4522
24	17-52	11	2925	14-40	3	4624



```
1    DATA 138.994,139.106, 138.856, 138.075, 138.175
2    FOR X= 1 TO 5
3    READ O(X)
40   NEXT X
50   FOR Z=137 to 138 step .1
60   B=150     (Set bandwidth to 150 KHz
70   B=(B/1000)/2
80   FOR S=1 to 5
90   FOR t=1 TO 5
100  IF 2*F-X > Z-B AND 2*F-X < Z+B THEN PRINT #2,Z,F,X,2*F-X
110  IF 2*X-F > Z-B AND 2*X-F < Z+B THEN PRINT #2,Z,F,X,2*X-F
120  NEXT T
130  NEXT S
140  NEXT Z
```

	Unwanted frequencies:		
Rx Freq	Freq 1	Freq 2	Mixer Product
137	138.075	139.106	137.044
137	139.106	138.075	137.044
137.1	138.075	138.994	137.156
137.1	138.075	139.106	137.044
137.1	138.994	138.075	137.156
137.1	139.106	138.075	137.044
137.2	138.075	138.994	137.156
137.2	138.175	139.106	137.244
137.2	138.994	138.075	137.156
137.2	139.106	138.175	137.244
137.3	138.175	138.994	137.356
137.3	138.175	138.106	137.244
137.3	138.856	138.075	137.294
137.3	138.856	138.075	137.294
137.3	138.994	138.175	137.356
137.3	139.106	138.175	137.244
137.4	138.175	138.994	137.356
137.4	138.994	138.175	137.356
137.5	138.175	138.856	137.494
137.5	138.856	138.175	137.494
137.9	138.175	138.175	137.975
137.9	138.075	138.175	137.975

Hidden Dishes

In answer to J. Wilkins letter Newsletter No14, it is possible to operate a Meteosat system with a dish inside the roof space, at least I can obtain satisfactory results here in south Oxfordshire.

The system consists of a Rig dish and feed horn, a Dartcom downconverter, an AR2001, scanner and a framestore. The roof of the building is south facing and is a fairly low pitch with 3/4 inch cement tiles and lined with roofing felt. The quality of the pictures vary from fair to very good depending on weather conditions and time of day, however they are always usable even from Meteosat 3 with its lower output.

I have also used the system with a JVL Quad Loop Yagi which produces excellent results even behind the glass of the south facing window and a usable signal through a cavity wall! Unfortunately the low pitch of my roof prevented me obtaining the correct angle when attempting to use this 3 meter length antenna and I was forced to manoeuvre a dish through the loft access door and over the assault course of joists to a suitable location where it was aligned using an extension speaker on the receiver. (I initially over looked the fact that the element in the feed horn must be horizontal for this satellite!)

However since installing the dish, the results have been very rewarding particularly the total earth pictures and the relays from the GOES EAST satellite including those of devastating hurricane Gilbert.

I am sure that many enthusiasts will be able to find a good location for dishes or long Yagis outside and this will obviously provide the best signal strength. However for those with unsuitable or exposed site, I suggest that they try the antenna in the roof space or behind a window as the results from the geostationary satellites are well worth the cost of the downconverter and antenna especially as these items are then protected from the elements.

Bob Needham

Estimation of surface pressure from satellite cloud patterns

by J.J. Morris, G3PHA

When a wave first begins to develop, the band of cloud brightens and starts to bulge anticyclonically in response to a vigorous short wave trough aloft. At this stage of development, the depression or future cyclone's central pressure is usually in the access of 1,000 mb. As the system begins to develop the cyclone blowing to the south west of centre becomes very pronounced.

As the pressure falls into the 999 region this first signs of a dry slot of clear air forming at the rear edge of the main solid bright cloud mass is observed. A 'V' shaped slot is produced in response to cold advection and sinking motion at the lower atmospheric levels. This intrusion of dry air is characteristic of a rapidly developing depression of cyclonic proportions. When the slot becomes more pronounced the pressures fall.

As the low pressure system begins to develop and intensify, the upper-level circulation becomes more nearly vertically aligned with the surface wave and the multi-layered cloud band begins to wrap around the lower presser centre. When the distinctive hook shaped pattern emerges the central pressure falls to around the upper 980's.
At the bottom 970mb level the cloud hook or spiral is wrapped around the centre almost one full turn.

At this stage of development the storms circulation centre, defined by the spiral clouds is located towards one edge of the cloud mass (usually the southern or eastern edge) with the heavier clouds found to the north and west of centre.

From time to time numerous cold air convective showers are observed over a wide spread area to the west and south of the main cloud system and identified by the cellular patterns. This indicates the possibility of extremely cold air aloft and an intense upper level disturbance. these conditions suggest the storm my be deeper at the surface than the basic pattern implies.

As the pressure falls below 970 mb the cloud band wraps completly around the central core one to one and a half times. The more centrally located and symmetrical the circulation of the tight spiral cloud mass, the lower pressure whilst an elongated cloud pattern suggests a less intense or filling low.

Occasionally the curvature of an intense low can be defined so tightly by spiralling cloud's that an 'eye' appears similar to that found in hurricanes.

As the system enters the 'mature' stage the cloud mass with its tight curvature becomes dislocated from the baraclinic cloud band. Here the cloud pattern begins to decay loosing its distinctive shape but with pressure still remaining low.

This technique estimates surface pressure for storms over open oceanic areas in the prevailing polar westerlies.

J.J. Morris G3PHA

References

(a) The identification and interpretation of cloud vortices using 'TIROS' observations. Sherr, P.E. and C.W. Rogers

(b) Mariners Weather Log, Vol. 24 No2.

USING THE SYSTEM:

a) Compare the satellite image cloud pattern to the various patterns found on the chart.

b) Locate the pattern on the chart most closely recsembles the storm you are classifying

c) Having identified the pattern follow its column to the top until you locate a range of pressures. The lowest central pressure of the storm will fall within that interval.

d) Technique used for storms (cyclones) in the polar westerlies over oceanic regions.

CLOUD PATTERN CHART - J J MORRIS:

below 969 mb

960's and below: cloud band coils around centre 1 & 1/2 times with low and middle cloud bands sometimes filling in between the encircling cloud band

990 - 999 mb

When pressures fall into the 990's the cyclonic bowing becomes more pronounced, by 990 mb the cloud system begins to develop a dry slot

as the system enters the mature phase it becomes detached from the thick baraclinic band

970 - 979 mb

in the 970's the cloud band wraps around almost one full turn

980 - 989 mb

when systems deepen into into the 980's the cloud band develops a distinctive hook. By 980 mb the cloud band wraps around the low 1/2 to 3/4 times

SATELLITES AND THE MEDIA
by Lawrence Harris

Since 1963 the local paper have always contacted me concerning matters of astronomy and space. The first occasion was when my headmaster let them know that I was going to photograph an eclipse of the moon. Fortunately the skies were clear and my photographs were published on the front page that same day.

My career (part 1) took me away from Plymouth to work professionally in space research and then career (part 2) brought me back to Plymouth where I continue enjoying astronomy and space matters as a hobby, becoming chairman of our astronomical society (which I started back in 1965!)

I am regularly asked by local radio,press or tv (3 local papers) to comment on anything regarding satellites, space or even UFO'S! I enjoy doing this because I believe in encouraging a general knowledge of space matters; the media have a dreadful habit of getting things wrong.

Cosmos 1900 was a good example; a reporter rang me up, concerned about the possibility of fallout spreading over the southwest (in the holiday season!) so I was pleased to be able to provide scientific comment. I would add that I have never received one penny for all these efforts.

Things don't always run smoothly of course. One BBC interview which was carefully filmed and annotated over some 2 hours, was shown with the wrong caption and the reporter described digitalker on UoSAT-2 as a talking American weather satellite ! No matter how careful you are sometimes they get it wrong! Sadly, following that broadcast I received a most unpleasant offensive letter from someone who should know better; but to compensate I had many calls from friends saying how much they liked the item.

Barely 10 days later the local ITV filmed me again in my receiving station, this time on a astronomical item-and and just a month later I was again filmed by the BBC regarding pollution visible from weather satellites. Just a few days ago Radio Devon interviewed me about OKEAN and 2 weeks ago I did a phone in on Plymouth Sound about astronomy and satellites.

So public interest is there and I propose to continue to foster it by disseminating accurate information in an enthusiastic manner. It is a pity that in certain quarters attitudes appear to differ on cooperation.

A Season of Transmitter Changes.
More Russian news from Lawrence Harris

Met 3/2

This Russian meteorological satellite has under gone an amazing number of operations during the winter months and so I have catalogued my observations as follows

After a period of non transmissions in the 136 MHz band I heard it on 22 December 1988 at 1547 UT on a north bound pass when it transmitted a visible picture. At 1550 UT it entered twilight and the signal changed to a short set of bars with no picture content. 4 minutes later the picture became white level only, and 1 minute later an IR picture with an "inverted" thermal profile was transmitted. That is inverted with respect to the NOAA format.

This sequence of change over delay was to be repeated many times

On the following days Met 3/2 was heard as usual. I logged the sea appearing black on the 1735 UT pass near Greenland presumably I had made a mistake at that time since I am now accustomed to the white sea thermal format? On the 2320 UT pass I logged the sea as white. Possible on board image reversal? Also on that pass I logged Italy on the left of the picture, Black Sea in the centre and Caspian Sea on the right ? Is it possible that Met 3/2 has a system capable of picture swath adjustment ?

On 24 December at 1315 UT I logged the picture as suffering from streaky whites. Presumably the image electronics haven't yet been changed even for this new series ? Also noted on many passes is a signal fluctuation.

The Eastern limits seen from Met 3/2 from my location include clear views of the Urals, the Kuybyshev reservoir and the river Kama.

On 27 December at 1228 UT 3/2 switched off passing into northern twilight. At 1410 UT it stayed on ! I then noticed that the relative position of the IR phasing bars had changed, compared with the visible bars. I suspected that efforts were being made to synchronise the pictures. The next day at 1445 UT the bars were synchronised.

This process of some passes including IR transmissions and others not continued almost daily for some time with the bars remaining unsynchronised. Detail in the IR pictures was analysed by computer and found to be better than the NOAA ones. I took several pictures and some screen dumps including one of Sicily.

On 3 January 1989 the next phase was observed at 1551 UT when after the visible picture the transmission changed immediately to a synchronised IR picture with no delay ! The five minute wait was over. On that pass I saw the whole of Greenland! Later passes reverted to the previous delay sequence.

On 20 January 3/2 switched off in twilight during the 1236 UT pass. The aperture sticking problem was evident on this pass as well. At the current time (9 February at 2150 UT) 3/2 is transmitting a blank IR image!

Have any official announcements been made about the winter season of transmitting changes of Met 3/2 ? I've certainly been kept busy logging each event.

COLINEAR FOR 1.7 GHz by Gordon Anderson

About 14 months ago I was given what turned out to be one of the best pieces of advice ever given to me and that was to become a member of RIG. I now find my self continually looking forward to the next Newsletter, having read the print off the previous one, (plenty of back issues please, especially articles from issues 1 to 7 !!).

I have at last decided to add a little contribution of my own to our Newsletter and pass it one to any interested reader the details of building a colinear to be used at the focal point,(in one plane only of course), of a trough reflector.

Why are so few people using this kind of antenna ?, I ask myself, or at least I assume that this is the case due to the lack of information or comments about the same. There are some good reasons for using this kind of antenna for either Meteosat or the Goes E. sat.

First there must be many readers, who due to an obstruction of one kind or another need to have their vital piece of equipment mounted on the upper part rather than the lower part of the house or in the garden, to receive a good signal, this applies especially Goes E. sat. which I have found to be only about 8-10 degrees above the horizon,(interested parties please note- vertically polarised for us in the U.K., prone to severe fading, I assume due to the amount of atmosphere the signal has to pass through but well worth receiving from heading WSW), anyway back to the matter in hand, obviously we need low windage and a loop yagi has not got the necessary gain for the Goes sat. and Meteosat 3 in its present condition.

Another reason I hear you say ?, o.k., ease of building. In my opinion a trough reflector with marine ply cheeks, (1 inch thick), and 15mm copper pipe reflector bars but not more than one and a half inches apart or use what you will, but cover all bars with wire netting as fine as you can get to save on losses. My trough reflector is 54 across by 38 inches high, (reflector bars vertical), and the area of the forward reflector needs only to be about 7% of the area of the main reflector, positioning of the same is not circital with relation to colinear but both need to be near the focal point of reflector of course, the f/d ratio of my antenna was about .4 to keep the antenna fairly compact, trial and error is of paramount importance once that you have established contact with Meteosat and I have not gone into constructional details of the reflector because you will have your own ideas on the subject, my aim is to concentrate on the much more complex colinear required to stretch along the focal point of the single plane reflector, I might add that a properly constructed and tuned colinear together with its forward reflector could possibly have more gain when compared with a monopole within a feed horn and both being used with a similar sized trough reflector dish, although be it that the former is a single plane device, I feel that the colinear more than makes up for the losses of its reflector.

I have constructed three solid dishes with pyramidal feed horns, these having been compared to the RIG feed horn with no noticeable difference in gain, firstly a 1 meter dish, then a 4 foot and currently I am using a 5 foot dish for Meteosat reception, my trough reflector is mounted high up on the gable end receiving Goes E images, but prior to this was receiving Meteosat images.

I am currently using the Microwave Modules down converter together with a 1.7 Ghz pre-amp. It might be worth mentioning that I shall soon be purchasing the RIG down converter and use this with the pre-amp for the Goes E. satellite, the fading signal can be annoying and one needs as much gain as possible, it will be interesting to see the results of this down converter. Please use the Meteosat signal for setting up your antenna for maximum gain, the Goes E. can be misleading.

Incidentally, I use a coaxial type change over relay from Maplin in the short 1.7 GHz. run of coaxial cable from each antenna so that I can switch between satellites from the shack. If you only have one pre-amp/down converter combination then I have found that these relays are not to loosy at 1.7 Ghz.

The colinear was first used at 934 MHz and after a few months trial and error, working on different size of matching transformer and

phasing coils, together with various half wave and five eights elements, I found the combination was a stack of six five eights elements, all, but the first element was electronically shortened by its joining phasing coil. Anyway the result was a very high gain colinear that would hold its own against the best of the comerical colinears available for this frequency.

The colinear that is described in this article is the result of test using a smaller version of the above design and as far as I know is not used in this form in the 's' band.

To help with the construction of the colinear, with reference to the diagram on the next page, here are a few notes:-

As usual at this frequency keep the tail of the coaxial cable emerging from the bottom of the 15mm copper pipe as short as possible.

The inner conductor is soldered to the top of the matching transformer coil which adjoins the base of the first five eights section. The braid is soldered to the copper pipe at a point near to where the bottom of the transformer coil is also soldered to the pipe, and make this a good joint because the wire sections and coils are all supported here.

Do not be tempted to wind these coils onto any permanent formers, they are air spaced and the introduction of a dialectric will alter their value and in that case the lengths of all the coils and radiating elements will have to be adjusted.

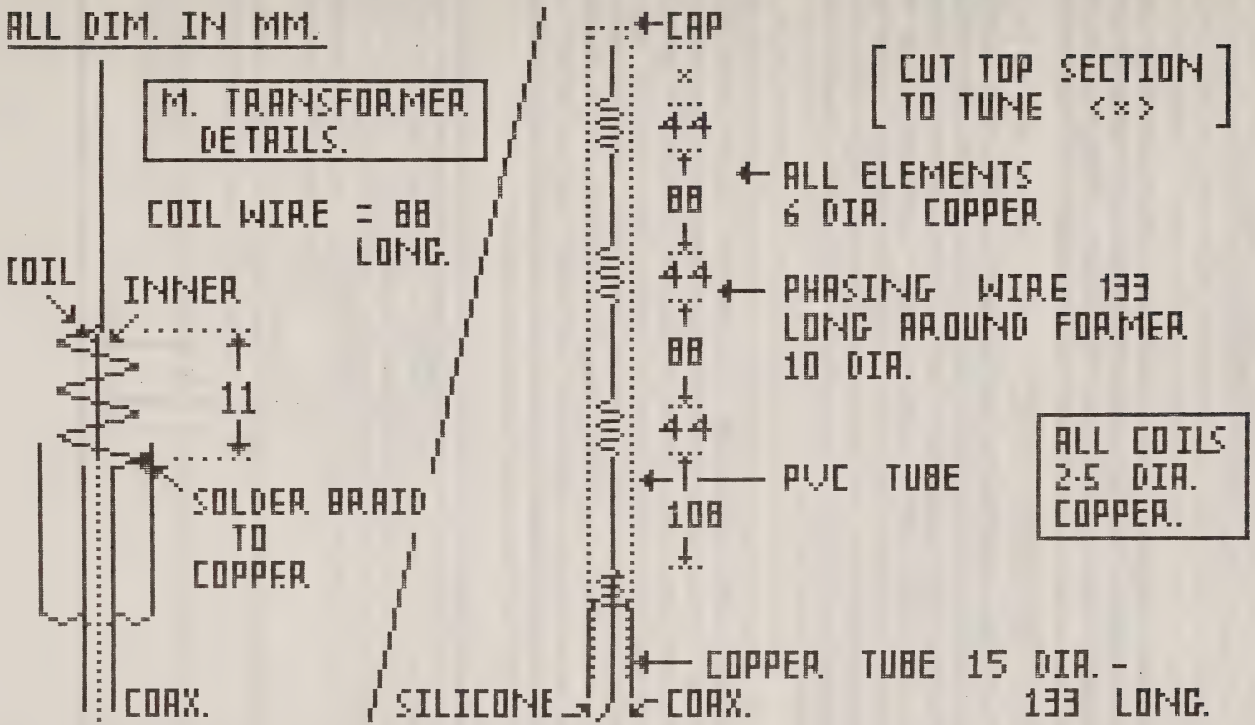
Use a bare 2.5mm copper wire, (ring main cable), form coils around the 10mm copper pipe as stated in diagram, altering this size may change coil values.

Seal end of pipe with silicone or car body filler, making sure that coax cannot be pulled, thus putting strain on the transformer.

The PVC outer covering is 20mm electrical conduit and when cutting top section for maximum sensitivity whilst receiving Meteosat signal, this covering must be in place, its presence effects tuning of the antenna. Finally, seal both ends of conduit with silicone, this should also hold top element for about half an inch from end and when set will take weight off the lower coils. To extend casing to 38 inches or so then PVC conduit couplings can be used.

Good luck with your co-linear and trough reflector
Gordon Anderson.

CO-LINEAR FOR 1·7 ghz.
(Stack of 4 elements.)



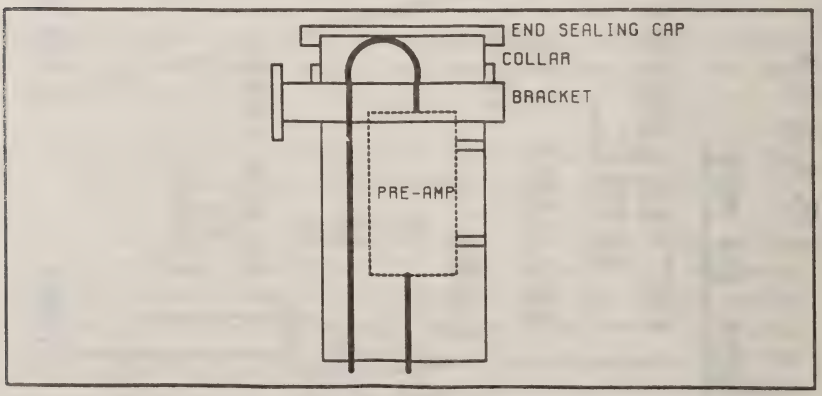
A WEATHERPROOF ENCLOSURE FOR PRE-AMPS

RICHARD OSBORNE GW4BVT

As I was putting up my crossed dipole to receive the polar orbiters, I was faced with the problem of providing a weatherproof enclosure for the RIG pre-amplifier. I intended to mount this on the top of the support pole just below the reflector rods. I had already built the pre-amp into the recommended RS screened box and fitted an N-type connector at each end.

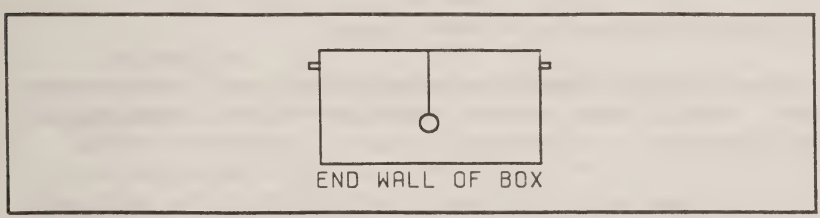
The obvious solution was to put the screened box inside a larger water resistant box. However, this involved cutting holes for cable entry, immediately degrading its waterproofing qualities. Despite this, I did try to order a box only to find that it was out of stock from the intended supplier. I then started to think about an alternative enclosure which, while not specifically designed for the job, was obtainable locally. As it turned out, the answer was lying in the corner of my garage left over from a DIY plumbing job - 4" plastic soil pipe used for the outlet from loos.

The idea is to mount a section of pipe vertically with an end sealing cap on the top while leaving the bottom end of the pipe open. The coax cables can then be brought in through the open end from below which stops water running along them into the connectors so no waterproofing tape is required. The pipe is attached to the aerial mast or other fixture by dropping it into a plastic 4" pipe support bracket mounted horizontally. However, some form of collar is required on the pipe near the top to stop it falling through the bracket. In my case, one end of the pipe had an integral moulded collar with rubber O-ring seal. If only a straight piece of pipe is available, then screws through its wall or a large jubilee clip will do the job. The drawing shows the general arrangement.



The weight of the pipe keeps it hanging securely inside the bracket and no additional fixing is required. The pipe needs to be long enough to allow the cable entering the top of the pre-amplifier to bend without undue stress. A reasonable length is also required at the bottom to stop water from being blown up inside. To attach the pre-amplifier to the inside wall, I glued two lengths of aluminium extrusion to the screened box and then screwed these to the wall. However, there is no reason why other methods cannot be used. The 4" pipe, end sealing cap and support clip should all be available from plumbers' merchants.

I adopted the same idea when I fitted the Dartcom Meteosat down convertor next to the dish in the garden. I first put the down convertor into a plastic box with snap-on lid which is designed for food storage. The box is made by Stewart and has the code 297 moulded into the bottom. It is readily available from kitchen accessory or hardware shops. By coincidence, it is an almost perfect fit for the down convertor. I slit one end wall of the box down the middle for about half of its height and then enlarged the end of the slit into a 10mm hole for the incoming cable from the feedhorn of the dish. The plastic is sufficiently flexible to allow the cable to be pushed through the slit so that the N-type connector in entirely inside the box. At the other end, I cut a hole large enough for the BNC connector.



Once the cable from the feedhorn is connected to the down convertor, the lid can be put on. By another coincidence, the box is an interference fit inside the 4" pipe and is held firmly without any additional support. However, to be on the safe side, I put a couple of screws through the wall of the pipe to stop the box from dropping out. I positioned the down convertor with the N-type connector pointing to the open end of the pipe as the low loss cable from the feedhorn is not flexible enough to bend 180° inside the pipe

The internal diameter of the pipe may vary slightly between manufacturers so the fit of the plastic box needs to be checked.

The pre-amplifier has been in position since the autumn and has resisted all onslaughts by the weather.

Receiving UoSAT-2 and Use of the BBC SATPACK Software from AMSAT-UK.

by John Wedderburn, Aldwickbury School

A. A Beginners Guide to Receiving the UoSAT-2 Satellite.

The receiving system that I use at school is as follows:-

5 element circularly polarized yagi from Jaybeam. (The antenna has been set up on a pole such that it can be moved in the horizontal plane with one rotator and in the vertical plane with the other.)

IC 211E (of rather ancient date - but it works well)

I also use the G3RUH decoder which I must say has improved the general performance of my system a hundred fold.

B. Preparation to receive the 144Mz beacon.

1. Using the Orbital Prediction package SATPACK disc 1 (more on this later), find out when the satellite is predicted to appear on your local horizon.

2. This package also gives you Azimuth and Elevation data which tells you if the satellite is coming from the south (ascending) or coming from the north (descending) in its orbit. Set the antenna in the appropriate direction.

3. Switch the receiver on and put it on the beacon frequency of 145.825 MHz. Because my receiver is narrow band, I have to shift the frequency quite a bit to take into account the doppler shift. I usually find I have to move the dial reading at least 2 KHz.

4. I usually record the data as I receive it. Its safer to do this. Although there is always a small deterioration of signal because of this, the number of times I said if only, I now record it all!! The higher the quality of recorder and tape the less the deterioration is of course. I have just started using a stereo Hi-Fi recorder and chrome tape with excellent results.

So by now I have the antenna in the right direction, know which way I'm going to swing it as the satellite comes over, got the receiver on and on the right frequency, got the connector at the back of the receiver plugged in to the right socket in the tape recorder and head-phones plugged into the recorder to monitor the recording.

Now sit and wait.

With any luck the prediction is correct and the satellite comes up over the horizon when expected. Because my system is manually operated, I have to use the rotators to manually follow the satellite as it passes over. Then it is simply a matter of keeping the antenna pointing in the right direction for maximum signal strength. I often find that the signal is just audible when predicted then fades a little and then comes back again. I presume this is due to the edge effect of the horizon.

At the end you should have a recording of the whole pass which can then be analysed using the AMSAT-UK software.

Analysis of UoSAT-2 Data using the AMSAT-UK BBC Software.

B. Introduction
B.1.SATPACK disc 1 - Orbital Predictions
B.2.SATPACK disc 2 - Telemetry Analysis.
B.3.SATPACK disc 3 - Graphical Analysis of telemetry
B.4.SATPACK WOD disc - Whole Orbit Data Disc

B. Introduction

These packages have been written mainly by Eric Twose and Craig Underwood. I would like to say how good they are before going on to explain some hints on their use. I could not have got as far into the data analysis as I have without these discs. They are fully menu driven, thus very easy to use, and there are only a few points I would like to suggest to a first time user to look out for.

B.1. SATPACK disc 1 - Orbital Predictions.

Boot up the disc and enter the date and time as you want. You are then faced with a 9 option menu. The disc comes with several up to date keplerian elements for all the usual satellites including UoSAT-2. It is also known as OSCAR11 and will be found on this disc as OSCAR11 not UoSAT-2. The options I use most are 2 and 3. The others are more useful after the pass has been recorded. If you have been used to using the oscar locator then option 6 and 7 will look familiar.

Option 1
If you need to up date the keplerian elements you will need to consult reference 2. The system is menu driven and very easy to use. You will also need to know the latitude and longitude of your station which can be obtained from an OS map of your area.

Option 2
This option gives a visual image of the satellite's position in relation to the earth's surface and a circle which shows the extent of its visibility to the observer. Other data is also displayed under the map of the earth such as the date and time, orbit revolution number, elevation and azimuth.

Option 3
This option is the one I use most often. It produces a chart of when the satellite will be visible to the observer at the station that is visible from where you are listening from. It ignores all the irrelevant data. It also allows you to make a hard copy of the predictions as they are calculated. Again, only data that will be of use to you in finding the satellite is printed.

Option 4
You can modify the basic satellite orbital parameters using this option. This need not be done very often, if at all, unless there have been major changes of direction or of altitude of the satellite. These of course change slowly with time and the critical parameters are also found in the keplerian elements and are up dated using option 1.

Option 5.
This option allows you see the ground track of the satellite over several orbits either as little squares drawn over a map of the earth or as a table of time with latitude/longditude and height. You have a choice of anomaly or time as the variable in both cases. By entering the time for the WOD to start when you first boot up the disc, this option can be used to plot the satellite's track for as many orbits as you like. It also gives you the option of hard copy - the default being the Epson FX printer or compatibles.

Option 6.
You use this option to see, in table and graphical form, the azimuth and elevation of current satellite orbits. You can chose how many orbits you want to look at and the time interval between each reading calculated. Each orbit is about 100 minutes so the program uses this as being equivalent to one orbit. The visual display of elevation shows at a glance the visibility of the satellite over the horizon. Those used to the oscar locator will recognize the 'dart board' representation of the satellite's track giving details of the azimuth at a glance.

Option 7.
This uses the data from option 6 and just displays the graphs generated by it.

Option 8.
This allows you to find the position of the satellite on the map of the earth knowing the time from perigee and the elevation of the satellite.

Option 9.
You use this option to see what satellite data you have on the disc. If you need to delete any of it, it gives you this option.

B.2. SATPACK disc 2 - Telemetry Analysis.

Option A - Display raw telemetry
Boot up the disc and using the first menu option (option A) check the data on the tape. This is to find out where on the tape are the bulletin boards, the WOD, the Telemetry, the DCE and the Keplerian elements.

Option B - Store raw telemetry
Having found out where they are, use menu option B to transfer the data you want on to disc. Transfer only the telemetry at this stage.

Option C - Recall raw telemetry
Use option C to check you have the data you think you have saved!

Option D - Post-process raw telemetry
It helps at the next stage to have a double disc drive but it is of course not essential. Using option D, process the telemetry. This usually takes about 5 to 10 mins depending on how much you have saved. It is important to save just the telemetry part of the data with option B because otherwise the processing system can take for ever as it will try (unsuccessfully !!) to process the DCE or WOD.

Option E - Display processed TLM-frames
This displays the processed frames as the numbers. Each number represents a value for each channel of telemetry. There are 60 analogue channels (0 - 59)and 10 digital status channels (60 - 69). Information on these can be found in the Data Handbook for the UoSATs. (See reference 4)

Option F - Display process TLM-channels
This option is the most helpful. It displays the processed data giving information as to what the channel is and the value in the units it is measured in. It is possible but tedious to plot these values in relation to time to show how they vary with time. The tedium can be relieved if you use SATPACK disc 3 which does this for you!!

The other options are self explanatory.

B.3. SATPACK disc 3 - Graphical Display of Telemetry

This piece of software takes the drudgery out of plotting graphs of the telemetry channels. It is well written and as before can be followed entirely from the menus.

You must create a special graphics file which can only be done from the post-processed file of SATPACK disc 2 (option D). Once created you can then display them singly, in fours or as a table. The graphical display shows how the parameter has changed with time and the table as well as tabulating the values calculates the mean between the maximum and minimum values received.

Again it makes things easier if you have a double disc drive because much more data can be stored on the data disc than there is room for on the system disc. The system disc uses about 90 kbytes leaving only about 10 kbytes left for other files.

B.4. SATPACK WOD disc - Whole orbit data disc

The menu options are

1. Telemetry
2. Status points
3. Whole orbit data
4. Raw telemetry

The first option tabulates the telemetry of both UoSAT 1 and 2 giving computer generated telemetry. For those without SATPACK disc 2 this is quite useful. Otherwise it has limited value. Similarly with the second option, if you have got disc 2 then it has limited value. You could say the same for option 4, but I have found it more useful than option A on disc 2 because it works better -it does not display all the spacer bits like disc 2. I use it mainly to find the right place on the tape before using option 3 for the whole orbit data which is I suppose why it was added to the disc in the first place!!

Once you have found the right place on the tape select option 3 and then the appropriate UoSAT which is UoSAT 2 in my case. You then have the option of choosing one of four graphs. Which you choose will depend on what data you have and what you want to do with it.

Suppose you have the data collected on Wednesday which is at the time of writing data from channels 17,18,19 and 29. In this case it would be worth choosing four graphs at first as you have four channels to display.

However, let's look at the one graph option first. Once you have chosen this option the screen shows options as follows:-

How many channels (0 to stop) ? 4
(The number is 4 because there are four channels in the data received)

Channel position (1 - 4) ? 3
(You choose the number you want. In this case 3 represents the third channel received that is channel 19. If you wanted to display channel 29 first then the response to this question would be 4.)

Channel number (0 - 67) ? 19
(This is the third channel as received in the original data.)

Start min (0) 0 (This is where you want the graph to start.)

Finish min (330) 330 (This is where the graph finishes. Remember that one orbit is about 100 mins.)

High count (999) 999 (This gives the maximum value that you could expect from the data.)
Low count (0) 0 (This gives the minimum value you could expect from the data.)

Pressing <RETURN> to the last four will put in the default values found in the brackets.

The next press of the return button draws the graph on the screen and the computer is now ready to receive the raw data from the tape. Start the tape and watch the data produce a point on the screen.

When it has finished, press f1 (function key 1) which saves what you have on the screen onto disc. This can be retrieved at a later date by *LOAD <filename> (You must be in MODE0 for it to work.) That done, press the <ESCAPE> key. You will then be asked

Overlat (Y/N)

The idea of this is to allow you to put more than one set of data on the same graph for comparison. This is achieved in very much the same way as before after you press 'Y'. So repeat the data loading procedure from tape and chose the channel you want. If you want channel 17 to be overlaid then the channel position is 1, channel number is 17 and the other options should be the same as the existing graph.
The other way to compare all four graphs is to choose the FOUR GRAPH option. This enables you to compare each channel 17,18,19,29 in that order on the screen. The only disadvantage of this is that they are of course smaller. What I normally do if there are four channels in the data received is to display them using the four graph option with the default settings for time and counts to see what limits there are within the data and from there modify the final printout to suit the data received usually using the one graph option with overlays. I find it is usually a good idea to save each screen to disc before I do anything else.

Once the screens have been saved to disc they can be retrieved using *LOAD <filename> in mode 0. They can then be dumped to a printer using *GDUMP. I use PRINTMASTER and the *GDUMP command I find works the best is *GDUMP 1 0 4 1.

The references are as follows:-

1. UoSAT Spacecraft Engineering Research Unit
   Department of Electronic Engineering
   University of Surrey
   Guildford
   Surrey GU2 5XH

2. AMSAT-UK
   Secretary
   94, Herrongate Road
   Wanstead Park
   London E12 5EQ - for OSCAR NEWS magazine

3. Remote Imaging Group
   14, Nevis Close
   Leighton Buzzard
   Beds LU7 7XD - for RIG magazine

4. UoSAT Spacecraft Data Booklet June 1987

5. IERE Special Edition for UoSAT-Supplement to Vol.57 No.5 Sept/Oct87

6. SATPACK discs obtainable from AMSAT-UK

ATARI Software,
Letter from Gordon Kaye

Thanks for the prompt December Newsletter, excellent as always.
I was interested to see the high proportion of members who are using computers of rather elderly technology to decode their images. I not also the increased correspondence about the graphics capabilities of the Amiga and Atari ST.

Some would dismiss these as games machines. It is the games requirement of low cost, speed, memory size and graphics that makes them worth a closer look.

The Amiga would on the face of it seem to be preferable owing to its 32 on screen colours as opposed to the ST's 16. In practice this may not be a big difference, because the higher resolution shows up the noise and defects in most amateur receiving systems, while reducing contrast in the image. I do not regret going the ST route owing to the comparative convenience, ease of use and the much larger selection of good value software and peripherals.

For two years I have been developing software for the ST, to what I hope is a professional quality. This I am currently retailing at £24.95 to cover the rather expensive cost of low volume production, before and after sales queries and to provide some compensation for the many long hours that it took to get it right!

It occurs to me that some members might like to up grade their computers while retaining their existing parallel decoding equipment. These members would be able to make do with detailed software instructions rather than a manual full of background information and are unlikely to have any queries owing to the simplicity of the upgrade.
Therefore 1989 members may buy the software and instructions from me at £16 (inclusive of p&p Europe).

The software features fast and easy data handling of 400 lines by 600 pixels to 128 levels, screen processing and zoom (200 lines x 320 pixels x 16 colours). Data files to and from disc (in paint program format), or printer. South/North flip, colour palette options, data and position report of mouse guided cross hair on screen. 3 month satellite near overhead forecast to screen or printer. I also include a few 'free' utilities.

A demonstration disk is available at £3 (deductible in full on return against the cost of a full program). This is double sided format unless single sided is requested. I am sure that local Atari shops will be pleased to show these off to those do not yet own an ST.

I am happy to help with any queries, and would also welcome contact with any members local to me for general exchange of information and experiences. I am considering modifying the software to accept serial data (for instance from a framestore), and would welcome contact from anyone interested with helping or in the resulting project.

Leslie J. Kaye
Fieldvale,
Park lane,
Snitterfield,
Warwickshire. CV37 OLS

Satellites on Ceefax

Have you seen the Meteosat pictures on the Ceefax Telesoftware pages ? They appear almost unannounced recently. I just happened to see a bulletin on Packet Radio saying they would be coming shortly and then they appeared, replacing the advertised software for the week. My first reaction is that the pictures themselves are not at all bad, showing the weather system over the north Atlantic with the coastal outlines as is usual for Meteosat. They are certainly better than the pictures provided on Electronic Mail by the Weatherlink service of Microlink or the Swafax pictures. I gave up looking at these sometime ago as the telephone and Email charges became prohibitive.

The BBC has provided 16 grey scales by using colours which look very odd on a colour monitor but give the correct grey scale density on a monochrome monitor. (The weatherlink service only provided a choice of 4 or 8 grey scales.) To achieve this the BEEB uses Mode 2 on a model B or Master Computer with the result that the definition is somewhat chunky but I think, as I said before, that it's not bad. Apparently there is a better definition available for some owners of the Archimedes computer but I'm not in that league yet though still have hopes. To help with matching the picture to the geography they also provide a map of the north Atlantic which could be used as an overlay on printed out displays.

The BBC provides a series of programs which will be continuously available on the Utilities section of telesoftware. The principal program is SATLOAD which is used in conjunction with a Teletext Adaptor such as the Acorn or Morley units. This finds the catalogue of images available, at present the previous week's images, and it is possible to select which image is to be downloaded or to enter L for the latest image. This is where, at present, the service is not up to our hopes as the latest image is well over 24 hours old and I feel that it needs to be no more than a couple of hours old to be of use, certainly so when they get round to putting the European images on as well as the Atlantic, as promised.
The downloading is somewhat slow as the data occupies about 25kb and is spread over 26 frames, ie the CEEFAX pages have to cycle 26 times to download an image and this takes about 9 minutes assuming no frames contain errors in which case you wait until that frame comes up again, another 9 minutes. The data is saved typically saved in a file called WEDATL (Wednesday Atlantic) and is available for sophisticated programmers to manipulate to their delight.

The next program is called DISPLAY and decodes the data into a form suitable for display on the BEEB (a program called ARCDISP is provided for the Archimedes) and this takes another 8 minutes to build up a screen image in Mode 2.

This screen is saved to disc in a file called typically a 757387 which relates to the Julian date. This screen image can be recalled to screen at anytime by using the * LOAD command and can be printed out to a printer using a suitable printer dump program such as the BEEBUG dumpmaster.

Another program called SATSEQ enables a series of saved images to be displayed in succession to show movements of weather systems and is quite impressive.

The documentation provided with the programs is comprehensive. A textfile called S/GUIDE is a simple, one page set of instructions. A much more detailed textfile is called SMANUAL and for the real pundits there is a very detailed manual called PROTOCL. Another program called SATSHOW gives information about the source of the image and various other parameters relating to it. However, the version I tried has some error which causes it to stop some way through the information. I also found when decoding the images an ARRAY ERROR sometimes occurred before they were completed and so didn't save properly. The decoding process involves a complicated run-length encoding algorithm and this error seemed to occur when long white runs existed. Hopefully this will be recognised and an amendment issued. The BBC have already issued corrections to the SATSEQ program.

Now all this doesn't provide quite the same satisfaction as building your own Meteosat receiver and decoding your own pictures in real time but as yet another source of satellite images I think it deserves to be looked at, but to be useful service the BBC will have to get a quicker distribution of the latest image and show not only the Atlantic but also European images such as the NOAA satellites provide.

Peter Ball G1YFL

KETTERING GROUP TECH MEMO DH 8901

Loss of Attitude Stabilisation of Feng Yun One (88/80A)

Dave Hawkins January 1989

Feng Yun One (88/80A) was launched on the 16th of September into a sunsychronous, retrograde orbit. Soon after launch the Kettering group reported APT signals being transmitted on 137.780 MHz and this was believed to be the only transmitting frequency. By the 11th of September this frequency was found by Les Currington to be a carrier only, but on the 3rd of October he found APT again on 137.04 MHz.

On the 18th of October G Perry in Bude and D Hawkins in Stevenage were both listening for signals from Cosmos 1870 on 180.0 MHz and independently found a carrier signal on 180.005 MHz between 06:58 GMT and LOS at 07:08:30 GMT which had a 2.08 second whistling phase.

D. Hawkins reported the same type of signal on the 19th of October between 05:15:57 GMT and LOS at 05:29:46. The elapsed time between the two LOS times probably represented 13 revolutions and indicate a period close to 103 minutes. The suspicion that it might be a Chinese satellite was confirmed when the two Line Element data for Feng Yun One (88/80A) was processed and found to fit the observations exactly.

During the very next pass of the satellite the 180 MHz signal was aquired at 05:56:17 and from it the spin duration time was measured as 2.083 seconds. APT was also found on 137.05 MHz at 06:56:50 and was found to be subject to the same fading rate of 2.083 seconds, leading to serious degredation of the signal and rendering useful picture construction impossible.

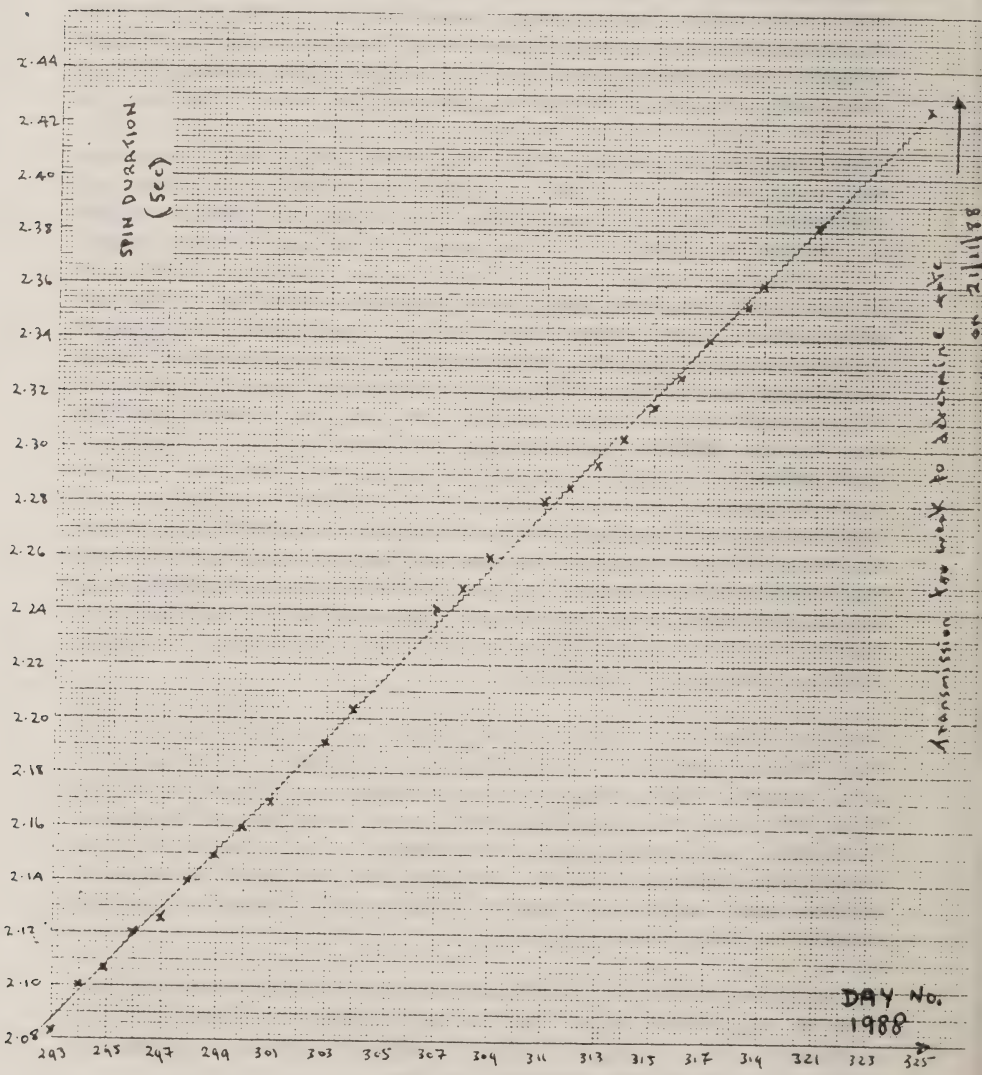
The fade rate of the 180.005 MHz signal was measured during the next few days and by 05:14 on the 22nd of October was found to be 2.120 seconds visual observation on the same pass between 05:18 and 05:23 GMT confirmed that the satellite was rotating and the visual flash rate was found to be 1.065 seconds, ie twice the rate of the signal fade, from which it was concluded that the satellite probably had two solar panels and henched produced two flashes per single rotation of the radio transmitter.

The following table and graph give the spin duration times measured from the 180.005 MHz signal for the period 19th of October to 21st of November 1988, when the radio transmitter failed. This shows a linear increase in spin duration with time.

DAY(1988)	293	294	295	296	297	298	299	300	301
SPIN DUR.(sec)	2.083	2.100	2.108	2.120	2.126	2.140	2.148	2.155	2.169

DAY(1988)	303	304	307	308	309	311	312	313	314
SPIN DUR.(sec)	2.192	2.204	2.240	2.248	2.260	2.279	2.285	2.296	2.304

DAY(1988)	315	316	317	318.5	319	321	325
SPIN DUR.(sec)	2.315	2.326	2.341	2.352	2.360	2.382	2.426



The Paging Problem
by Roger Barker, G4IDE

I hope the following comments will help others who are suffering from interference from the paging systems on 138 MHz.

I built my Cirkit receiver a couple of years ago. I was never very impressed by its performance and very soon started to have break through problems when someone started to run a taxi company from a house a mere 50 yards away.

At that point I started to seriously question the receiver design and collect circuit diagrams for some of the other receivers on the market. I obtained circuits for the Martelec receiver,the Maplin receiver and one which has no identification on it, but which I am told on good authority is the Dartcom receiver.

To summarise the receivers that I looked at -- the Martelec receiver , as most people know, is the circuit receiver with some small mods, the Dartcom receiver is obviously based on the Circuit receiver, but has a lot of the short comings removed, and the Maplin receiver appears to have been designed more or less without reference to the Cirkit receiver.

Three out of the four receivers the exception being the Dartcom- have two dual gate MOSFET RF stages ahead of a dual gate MOSFET mixer. This goes against all the basic principals of strong handling in VHF receivers, and is a certain recipe for disaster when you have something like the paging transmitters pumping out RF only a few hundred KHz away from the wanted signal.

Using the Dartcom design as a reference, I removed one RF stage from my cirkit receiver and removed the damping resistors across the tuned circuits in the remaining stage. The other significant change that I made was to remove the BF241'S from the IF stage and feed the filters with a source follower. This has two effects, firstly it removes excessive gain in the IF stage, secondly the very high input impedance of the source follower improves the selectivity of T1-the mixer tuned circuit. while I was at it, I also fitted a socket whereby I could sniff the 10.7 MHz communications receiver, mainly for use as a very large 'S' meter !

These mods not only completely removed the problem of the Taxi company but also resulted in a more sensitive receiver. I got the proverbial Sahara to Greenland coverage with crossed dipoles in the loft and no mast head pre-amp.

During the Autumn of 1988 I stopped using the receiver - I moved shack and the feeder from the aerial needed extending. Last week (February 1989) I finally got around to extending the feeder and the receiver soon burst into life on 137.62 MHz - burble,burble,burble- the pagers have struck ! Tuning around the IF on the communications receiver soon identified the problem - a colossal signal which works out to be on 138.175 MHz (which I believe is Mercury) which was managing to pull the SL6601 IF chip enough for it to lock on to it . That was the only problem, there were no signs of the receiver being overloaded.

My first practical thought was to implement the chain of filter mods described by various people in the Newsletter.

My second thought was to do some calculations:

The paging transmitter had to be pulling the SL6601 555KHz off its centre frequency, I found that difficult to believe. In the Cirkit/Martelec design the SL6601 mixes 11 MHz with the 10.7 MHz first IF to give a second IF of 300KHz. This means that it will equally happily respond to an image signal on 11.3 MHz, or 600 KHz above the unwanted frequency. 137.62 MHz + 600 kHz = 138.22 MHz. This is 45 KHz above the paging transmitter, but obviously puts the paging signal within pulling range of the SL6601.

The solution was simple-replace the 11 MHz crystal with a 10.4 MHz one so that the image was 600 KHz below the wanted signal and well away from the paging signals. Unfortunately I did not have such a crystal, but 10.04 MHz ones are fairly common item and I had one of those. This meant that the second IF became 455 KHz and two components around the SL6601 needed altering. C35 was changed to 100 pF and VR1 to 100 K. VR1 was adjusted on air for best reception.

The interference has now completely disappeared. To be hypercritical, I do not think that the SL6601 performs quite as well at 455 KHz as it does at 300 KHz and at some point I might get a 10.4 MHz crystal-but thats being fussy, the receiver is now completely usable. By the way, the site of the paging transmitter is less than 1 mile, line of site, from my house.

My conclusion:-

Two dual gate MOSFET RF stages + Dual gate MOSFET mixer + Loads of IF gain + Phasde locked loop demodulator = A bad receiver design;

add to that a strrong unwanted signal = BURBLE, BURBLE, BURBLE!!

Roger Barker

FOR SALE:

MSR 20 Satellite Receiver £75 ono
6 Channels fully xtalled
Auto scan / Manual select
Mains powered
No metering
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M.J.F. Terminal Node Controller £200 ono
will do packet, CW, RTTY, SCTV and FAX
(via computer with suitable software) via a printer.

Both items less than 1 year old.

Gordon Whale G7BCR
37 Porchester Row
Southampton. SO2 7JB Tel Southampton 436 413

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One Muirhead K441G Facsmilie machine. Multispeed, AM/FM, complete with paper, Toner and handbook.

Contact J. Morris, Bolton (0204) 40629

ERRATA Newsletter 14: Sent in by Malcom Fry, G4OFF.

a) Page 47, second paragraph, first line should be ....say 150 kHz (not 50 kHz).

b) Page 46, fifth paragraph item (1) should be talking about MINIMISING the noise bandwidth, not miniaturising it!!

FOR SALE:

As a result of purchasing an Archimedes computer and now running the Spacetech software, this now frees up my own built frame store.

The unit comprises 3 boards, including the A-D Module plus the four-frames which also reset on start tone of Meteosat. The box is poor but the workings are A1.

Also to go with it is the Philips 12" white paper high res monitor.

£220 ono the pair.

Lew Afford, 15 Craddock Drive, Nuneaton, Warwickshire. CV10 9EJ
Tel 0203 394294

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2 units available as a pair, one converted to WEFAX, one almost complete for spares.

£75 for both, with 2 rolls paper. carriage extra.

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CW9 7NP

ATARI ST
Satellite Image Processing Software

If you attended the N.E.C. Radio Rally in 1988 you may have noticed the computerised images on display on the R.I.G. stand. The images were produced on the Atari ST computer. The software to display the images has been further enhanced along with a re-design of the 001 frame store board used for data acquisition. The main features of the system are:-

1. With the use of the new 001 board, images can be acquired from the frame store logic, stored and displayed on the computer screen.

2. As the computer holds the image in memory the data can be processed to enable picture enhancement. The processed image takes up little display memory, therefore a large number of separate images can be sequenced to give the effect of cloud movement.

3. The computer has a reasonable colour capability enabling a selection to represent the varying shades of grey found on the frame store. All the colours can be set by the operator and the level representation can be adjusted.

4.Image Enhancement, the software is capable of contrast stretching the image to enable the interesting elements of the picture to be extracted. This has the capability of making a winter daylight image appear more like that of summer daylight.

5. The system has the capability of processing the data from all the orbiting satellites as well as the geostationary Meteosat. There is a zoom capability allowing the image to be expanded for analysis.

6. If the Meteosat satellite is used then the schedule for image reception and storage is controllable within the software. the computer can enable the 001 board to clock the data to the computer. The 001 board can be used transparently to receive images with out affecting the images on the computer.

The system has many other features, the package will soon be available so keep a look out in the RIG magazine.

For further details contact Peter Newman (0487 812121)

MEMBERS LETTERS:

Dear Phil,

Just a few lines to let readers know of my recent experiences using a loop yagi aerial for the reception of Meteosat 2 and 3.

Since the early 1980's I have been using a 1 meter dish of the petal type construction feeding a microwave Modules 1690 MHz converter.

This set up has given me reasonable results with only a small amount of noise on the signal.

Due to recent wind damage to the dish mount I decided to try a loop yagi aerial. I contacted JVL Electronics and after being assured by them that the gain of their loop yagi was approximately that of a one meter dish I decided to purchase one.

With the loop yagi connected to the convertor via 2-3 feet of UR67 cable the results were disappointing. The signal was only just audible over the noise level and was totally useless. After some fruitless experimenting I decided to purchase a 1690 MHz pre-amp supplied by VHF Communication. This pre-amp made some improvement to the signals but were still far below the quality I had been used to.

I have finally decided to keep the dish and have now fitted the pre-amp to it and I am now receiving good noise free pictures.

Paul Gulliver, G8JLV

HIGH SELECTIVITY UPGRADE FOR THE MSR20 RECEIVER

At the time of its arrival on the scene some three years ago the MSR20 satellite receiver provided a very satisfactory performance. Since then however, as many of us are now aware, the introduction of many new paging transmitters a few hundred kilohertz up-band has had a devastating effect on some users.

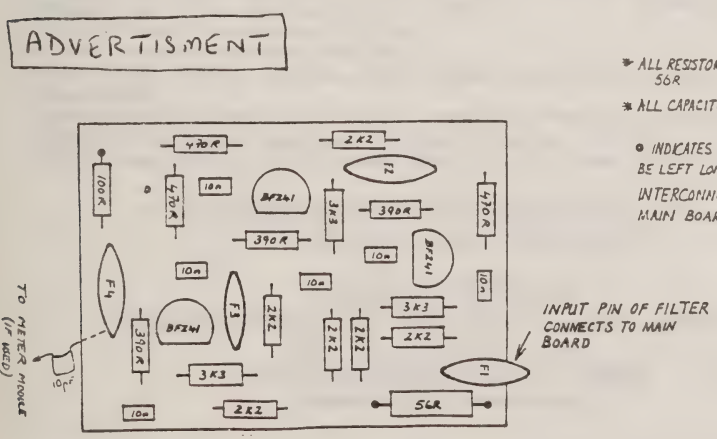
An effective solution to this problem is to introduce additional I.F. filtering, since it would be relatively expensive to realise the necessary Q at the front end. Several useful articles from RIG members have appeared along these lines, and the upgrade here presents nothing novel; it does anable those existing users of the MSR20 to provide extra filtering (and sensitivity) if they wish.

The new 10.7MHz I.F. strip completely replaces the original one which is removed from the board. It is replaced by a new daughter-board containing four 50KHz ceramic filters. These have been carefully selected using a sweep generator and spectrum analyser to match their passband characteristics. These ceramic filters have a passband attenuation of around 6dB, adding up to 24dB in this case. This, together with the fact that they cannot be successfully cascaded means that additional gain is required, and this is provided by three BF240/BF241s between the filters.

The daughter board neatly fits over the space vacated by the original I.F., the four interconnections being picked up directly from the main board.

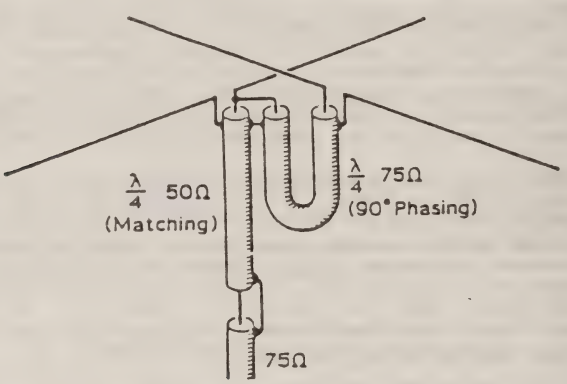
Brief consideration was given to the mixing of 50KHz ceramic filters with the wider 150KHz types. As shown below though, this produces a stepped skirt reponse which is not particularly helpful in attenuating the near-channel interference of concern to us.

A complete kit of parts, including the set of four matched filters, and the pcb is available from Martelec Ltd. at £14 inclusive of VAT and carriage. Sets of matched filters only are also available at £6.50 incl., although they cannot be supplied to specific frequencies.



MARTELEC MSA20 CROSSED-DIPOLE CHECK

It has recently come to our attention through a very observant RIG member George Brown that a number of Spacetech crossed-dipole aerials supplied through us may have the wrong lengths of 75 ohm and 50 ohm coax for the phasing harness. If you have one of these aerials - either through us or direct from Spacetech, and your signal strength is under-par this could be the reason.



The diagram shows the λ/4 lengths of coax cable, but of course a correction factor must be applied to allow for the velocity factor of the dielectric of the cable. Regretably this was not done on some aerials with the result that they ended up some 5" or 6" longer than required. The correct length for each of these sections is around 365mm (measuring the coaxial conductors, and not including the separation of inner and outer conductors at each end).

This error seems to be confined to earlier aerials which were supplied without pre-wired harnesses - if yours came to you pre-wired it should correct. Unfortunately the effect of this error is to make the aerial highly capacitive, and of course having the wrong impedance at 137MHz.

Chris Pretty G8LLM
Martelec Ltd.

GAREX ELECTRONICS

*** WEATHER SATELLITE SYSTEMS ***

SPECTACULAR NEW ATARI *ANIMATED* SYSTEM

Garex are proud to announce that they are the first appointed dealer for this incredible new Timestep product. Following on from Timestep's phenomenal success in the education market, a special low cost Atari ST version of their *animation* system is now available from stock. Simply plug in your existing receiver to view amazing pictures. For the ultimate add a Meteosat receiver for unbelievably smooth 14 frame *animation* that is completely automatic once set up. Just watch the clouds roll by ! New pictures are added twice an hour if required, the oldest being discarded automatically. This sophisticated package will run on any Atari ST1040 and compatible colour monitor. Complete with all software and colour-keyed Atari interface. This equipment is of such high quality that Atari UK exhibited it on their stand at Which Computer 1989 !
Interface and software, just connect your existing receiver. £299.00
Optional colour to 16 grey scale adaptor. £24.95
For those who would like a one-stop-shop, the complete package ready-to-run : Meteosat Dish, Pre-Amp and Receiver, 43M cable, Atari Interface, Grey Scale Adaptor, 14" Colour Monitor, Atari ST1040, Software (including demonstration disc) and, of course all other cables and connectors. On your doorstep £1,695.00

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The *BASIC* MICROWAVE METEOSAT system. For no complications a complete plug in and go package that requires no computer, no software, no extra monitor and can be up and running, including dish alignment within 10 minutes of receipt. 256 * 256 pixels and Timestep's digital 64 grey level output gives outstanding results. This is the system that the London Science Museum has chosen to display in the new Space and Exploration Gallery, for the next 12 years !.
Nothing more to buy:
Meteosat Dish, Pre-Amp and Receiver, 43M cable, Framestore, 12" B/W Monitor and, of course all other cables and connectors. £995.95
Also available less monitor. £885.00

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Meteosat receiver. Dish input and 2 watt audio output. £270.25
Meteosat Pre-amp. 15dB gain 0.6dB noise figure GaAs FET. £92.00
Meteosat dish, 0.9M with feed horn. £199.00
10M H100 fitted N connectors. £29.85
NOAA 10 channel receiver. £155.25
NOAA *BASIC* Turnstile antenna, ready wired phasing harness and a connector fitted £34.95
NOAA *BASIC* Pre-amp, 3 pole filtering, boxed and fitted with connectors, 14dB gain 1.0dB noise figure, for the Turnstile antenna. £24.95
NOAA cable, 50M high quality cable fitted with connectors. £24.95

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ATARI

A.C.S. SYSTEMS

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AMIGA

			NON MEMB	AMSAT UK RIG MEMB
	PC-PAKRATT	IBM-PC SOFTWARE FOR THE PK232	£19.95	£18.95
	PK-FAX	IBM-PC FAX SOFTWARE FOR PK232	£19.95	£18.95
	COMM-PAKRATT	COMMODORE 64/128 SOFTWARE FOR PK232	£59.95	£56.95
	COMM-FAX	COMMODORE 64/128 SOFTWARE FOR PK232	£59.95	£56.95
	COMM-FAX/CT	AS ABOVE BUT CARTRIDGE, MANUAL ONLY	£39.00	£37.00
	PK-232/BBC	BBC SOFTWARE FOR THE PK232	£26.95	£25.00
	PK-88/CBM	COMMODORE 64 SOFTWARE FOR THE PK-88	£59.95	£56.95
	PK-88/BBC	BBC SOFTWARE FOR THE PK-88	£26.95	£25.00
	PK232	7 MODE INTELLIGENT TNC,INC MANUAL CABLES	£279.95	£269.95
	PK88	BUDGET PACKET RADIO TNC (NEW ROM AVAIL)	£129.95	£125.95
NEW	TNTERM	ADVANCED SOFTWARE FOR THE BBC	£49.95	£45.95
NEW	AMIGA-FAX	TX/RX FACSIMILE SYSTEM (NOW CASED UNIT)	£109.95	£105.95
NEW	AMIGA-SSTV	TX/RX SSTV SYSTEM FOR COMMODORE AMIGA	£109.95	£105.95
NEW	AMIGA FAX/SSTV	SOFTWARE ON DISC ONLY (NO INTERFACE)	£59.95	£56.95
	FAX 1	WEATHER MAP/RTTY/ NAVTEX DECODER	£279.95	£269.95
NEW	FAX-1 PACK	FAX1 + PRINTER + PSU UNIT	£399.95	£387.99
NEW	WET-1	SHF WEATHER SATELLITE RECIEVER (SAE-INFO)	£399.95	£379.95
NEW	TW-2	MICRO WEATHER STATION WITH ANEMOMETER **	£114.94	-------
NEW	TWR-3	MICRO WEATHER STATION WITH ANEMOMETER **	£114.94	-------
NEW	PCW	IBM PC OR COMPATABLE WEATHER STATION	£229.95	£225.00
NEW	PCW6RAPH	EXTENDED SOFTWARE FOR PCW ABOVE	£ 68.95	£ 65.95
NEW	ROM1989	NEW UPDATE ROM FOR PK232 (CW IDENT ETC)	£ 15.00	£ 15.00
	SC1200	CENTRONICS 120 CPS 80 COL PRINTER NO NLQ	£114.94	£114.94
NEW	EPROM SERVICE	EPROMS PROGRAMMED TO YOUR SPEC (E6 RIG RX	)£ 7.00	££ 5.00
NEW	STAR LC10	80 COL MULTI FONT NLQ 144 CPS	£259.00	£246.00
	STAR LC24-10	24 PIN LOW COST MULTI FONT	£399.00	£379.95
	########## FREE CABLE WITH STAR PRINTERS ##########			----
	AMIGA A500	1 MEG DRIVE FREE MODULATOR + SFTWR	£399.00	£379.95
	ATARI ST COMPUTERS (STM STILL AVAILABLE @269) 1MEG STFM		£299.00	£284.00
	MF125 GENERAL COVERAGE HF RECEIVER (ASK FOR SPEC SHEET)		£375.00	£357.00
NEW	SPECTRUM +2 AND +3 PK232 SOFTWARE AND CABLES		£ 14.95	----
NEW	USE YOUR OPUS DISCOVERY DRIVE WITH THE SPECTRUM (ROM)		£ 12.00	£ 10.00
NEW	SPECTRUM +2 +3 6 WAY IDC TO MIDI CABLE		£ 9.95	£ 9.00
NEW	SPECTRUM +2 +3 6 WAY IDC TO 25 WAY D PLUG RS232 CABLE		£ 9.95	£ 9.00
NEW	AMIGA A500 DEMO DISKS :AMIGA FAX, WEATHER ETC		£ 5.00	
NEW	ATARI ST PK232 SOFTWARE (ALL MODES) TRIPPLE SCREEN (PD)		£ 5.00	-

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# RIG MEMBERS FAX PACK 1      COMMODORE AMIGA A500     £399.99        #
#                             AMIGA MODULATOR          £ 24.95        #
#  FEW 1ST ISSUE BOARDS       AMIGA FAX (NEW VERSION ) £109.95        #
#  OF AMIGA FAX LEFT AT                                -------        #
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#     PLEASE RING  AMSAT UK /  RIG MEMBERS ONLY ###     459.94        #
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SPACETECH NEWS

You might have seen our new **Weather Satellite Podule** for the Acorn Archimedes at one of the rallies. The results are spectacular. Already some folks have gone out to buy an Archimedes just to run this one application..need we say more! £259.95 (rig members £249.95).Phone for full description. Demo disc £5 refundable..copy and return!
Having trouble with Meteosat P2? Our new stand-alone **Meteosat receiver** is a superb no-compromise trouble free design ..even gives noise free pics from GOES-E with a 0.9m dish! £299.95. Ask for list of our other RF and decoding equipment. We can supply the YU framestore built and cased.

BOOKS:	Memb	Non-memb
Weather Satellite Reception: Chris Hornby. A guide to get you started,Aimed at the beginner,but useful reference.	5.50	5.95
Sourcebook of Remote Sensing: A guide to products, utilities etc. V.useful information source for enthusiast	14.25	15.00
Guide to Facsimile Stations: Klingenfuss. A wealth of info not only on FAX but NOAA,Meteosat etc.	12.00	12.00
Guide to Utility Stations: Klingenfuss.For dedicated SWLs	19.00	19.00
Britain from Space: Colour Landsat Atlas of British Isles.	11.95	12.50
Images of the World: Satellite image atlas	13.30	13.95
Posters and Teaching Materials. (All posters in colour)		
The Third Planet. Meteosat Whole Disc. 400x600	1.75	1.75
British Isles.Landsat natural colour. 480x710	2.00	2.00
Europe by Satellite.NOAA HRPT. Superb! 590x780	2.50	2.50
London. Landsat colour. Thematic mapper 30m resolution.	4.50	4.95
Satellite Images (1 large,6 small charts +booklet)	4.95	4.95
Satpack 1 & 2:NOAA HRPT images with overlays, interpretation and worked examples.From Royal Met. Society. (per pack)	2.40	2.40

High Gloss Prints: Colour, resolution up to 200 million pixels per pic!
Small: 9.25 (9.75) small framed in real wood 24.00 (25.75)
Large: 18.50 (19.50) large framed in real wood 34.50 (36.95)
Subjects include: whole disc, NOAA AVHRR Europe,UK cloudy weather, Landsat: UK, Scotland, Ireland. GOES E whole disc, Phone/write for list
NEW: The October Hurricane, NOAA HRPT. large only. 18.50 (19.95)
Videos: All videos £51.75 or £10.00 hire (+£10.00 dep.+£1.00 P&P) Please phone for current stock..Ideal for winter club night!
Slides: Many available with books and sound cassettes. Please write or phone for latest list before your lecture or presentation.
Equipment: All equipment listed here free P&P.

FAX1: We know it reviewed badly in RIG,but for its application i.e. HF FAX weather maps, the resolution is EXCELLENT. Phone for detailed spec and copy of more favourable review!	269.00	279.95
FAX1 + PSU + Printer (Epson Compatible Copal SC1200)	389.00	399.95
HF125 General coverage HF RX	365.00	375.00
Please phone us for your packet radio requirements.. e.g. PK232 with facsimile TRANSCEIVE (IBM,C64 s/w avail)	259.95	269.95

Single book orders £1.00 P&P. All other orders £2.00 P&P.
Equipment Orders FREE P&P .. Phone or write for latest lists/specs.

RIG HELPLINES:

General Enquiries & PCB Supplies	Phil Seaford	0525 384419 7.30pm - 9.0pm
NOAA information	Henry Neale	094 585 353
Russian, Chinese satellite info/status	Les Currington	0707 326058
Schools/ Educational enquiries, Meteosat status and European Space Agency	Colin Hall	School 021 778 1311 Home 021 449 0006
Framestore technical support	Mike Coombs	0530 243494 7.30pm - 9.30pm
"	Ian Gurton	05827 3770 7.30pm - 9.30pm
"	Dermot Dobson	Correspondence preferred
RIG Dish & Feed Horn Stockists	see back of newsletter	
Supplier problems co-ordinator	Stan Ames	05827 60538
RIG at Rallies 1989	Mike Coombs	see above for No.

AMSAT-UK, Hon Sec. Ron Broadbent, G3AAJ,
94 Herongate Road, Wanstead Park, London E12 5EQ

As Secretary I can asked for information regarding all types of micro of which I have little knowledge so to provide better information to RIG members on specific computer equipment we have identified the following helpers for specific machines & interfaces:

BBC Micro	Stan Ames	see above
Commodore Amiga	James Brown	0656 712632
Atari ST, Archimedes	Peter Newman	0487 812121
IBM PC	Dermot Dobson	see above

Please call at sensible hours ie 7.30pm - 9.30pm

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weather satellite systems and kits

MSD20 METEOSAT DISH ASSEMBLY

A high quality, precision made aluminium dish and mount assembly, complete with dipole feed. The universal mount design enables it to be either pole, wall, or patio mounted. Used in conjunction with our MSC20 ultra low noise downconverter it is capable of superb results otherwise only achieved with larger dishes. Diameter 1m (requires no planning permission)

Complete with mount & feed assy.	£139.73
Next-day delivery & insurance	£18.00

MSC20 ULTRA LOW NOISE DOWNCONVERTER

The ultimate in low noise downconverters for the best possible, noise-free pictures. The MSC20 uses the latest GaSFET technology to achieve its incredibly low noise figure. The MSC20 is complete with temperature controlled Meteosat ch1 & ch2, and housed in a weatherproof ABS enclosure for masthead mounting.

	£159.45
Optional regulated 12v PSU	£13.80

MSR20 VHF SATELLITE RECEIVER

A high-performance dual-conversion design optimised for low noise and high sensitivity. It incorporates audio mute, automatic tape-recorder siwtching, electronic channel selection, S-level and deviation metering as standard. Housed in a professional steel case, and complete with all leads etc.

Performance Summary:-

RF Bandwidth (3dB)	2.5MHz
IF Bandwidth (3dB)	50KHz
1st IF Frequency	10.7MHz
2nd IF Frequency	455KHz
Image Rejection Ratio	>100dB
Sensitivity (12dB Q'ting)	150nV
(fully Q'ting)	600nV
Supply Voltage	12v d.c.

Complete, cased receiver incl leads	£152.55
Kit (excl. case, but incl. all off-board components, leads etc.	£78.25
Module built, with off-board comps.	£96.75
Finished Case with meters, l/speaker, all connectors, leads, knobs etc.	£41.60

MSA20 CROSSED-DIPOLE AERIAL

A high-quality, well finished aerial designed specifically for weather satellite use. Comes complete with ground-plane radials, and now wth pre-wired phasing harness for even easier use!

Standard Aerial	£30.76
As above , but with integral preamp	£48.93

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MSS20 BBC BASED DECODER/SOFTWARE PACKAGE

Complete built and tested interface, designed for owners of Acorn model B, B+, and Master micros. This exceptional hardware/software package produces weather sat pictures as never before on a BBC. Host of excellent software features make this the best value system available anywhere, whether for educational or general interest usage.

Features include:-

- Zoom - x2, x4, x8
- Geyscale control for vis or I.R.
- User-defined colour palette
- North/South picture invert
- Printer dump (FX80 formats)

NOTE- The MSS20 system is capable of really excellent results, and should not be confused with other, inferior, BBC-based systems from elsewhere.

Send £3 for the demonstration disc and see for yourself.

£86.19

* * * * NEW * * * * NEW * * * * NEW * * * *

ARCHIMEDES-BASED WEATHER SATELLITE SYSTEM

At the time of going to press, this new Spacetech system should be available. It comprises a podule for the Arch, and embodies many advanced features for picture manipulation and control. Full details available on request. Approx. price £250.

MSG20 GRAPHSTORE - HI-RES FRAMESTORE

Graphstore is a powerful high-resolution framestore, with built-in graphics processor for unparalleled picture processing power. Basic operating mode gives two hi-res pictures of 512 x 512 x 128 grey levels. Alternate animation mode gives eight pictures of 256 x 256 x 128 grey levels.

Features:-

- * Zoom any factor from 1 to 16
- * Smooth XY Scrolling
- * Disc Dump and Read
- * Post Reception Processing (PRP)
- * Picture Animation (up to 8)
- * Facsimile Option (available soon)
- * Contrast Enhancement (available Oct)
- * Printer Dump Routine

Graphstore is a professionally-built system with extensive upgrade potential - usually in software. It is fully assembled, tested and cased, with its own internal PSU, all leads and manual, and software.

£399.91

OTHER KITS AND BITS.....

MSK20 137MHz Preamplifier	- kit	£10.95
	- built	£19.95
YU3UMV Framestore *	- (64K)	£80.72
	-(128K)	£94.97
LOK Sync Board Kit		£25.85

*Temporary price increase due to World memory shortage.